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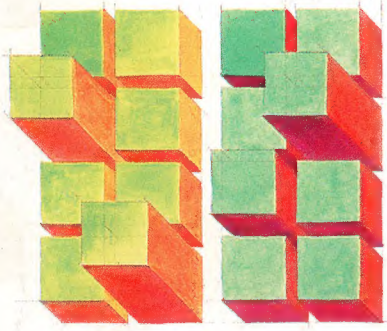

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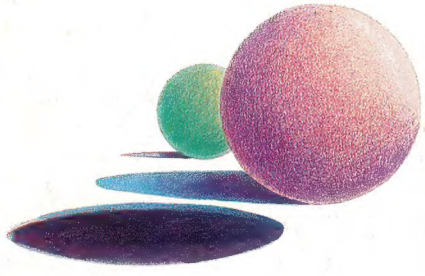

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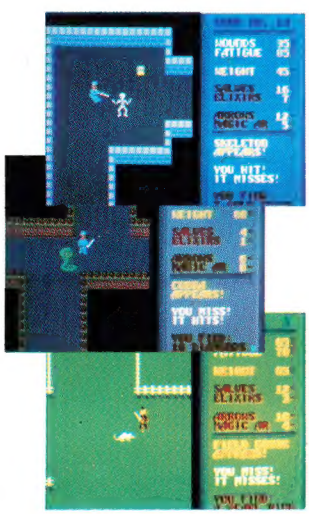

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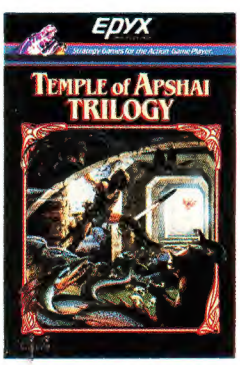

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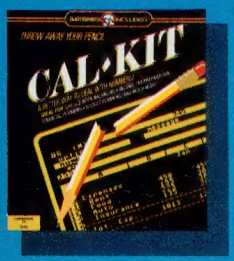

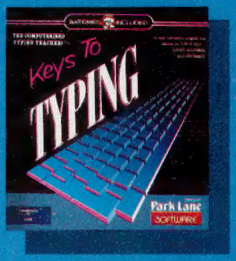

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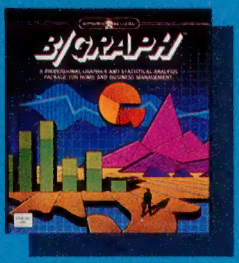

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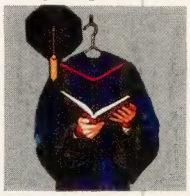

The College Board, operated by the College Entrance Examination Board, gives tips on preparing for the SAT, choosing a college and getting financial aid.

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A Printer For All Reasons

Search For The Best High Quality Graphic Printer

If you have been looking very long, you have probably discovered that there are just too many claims and counter claims in the printer market today. There are printers that have some of the features you want but do not have others. Some features you probably don't care about, others are vitally important to you. We understand. In fact, not long ago, we were in the same position. Deluged by claims and counter claims. Overburdened by rows and rows of specifications, we decided to separate all the facts — prove or disprove all the claims to our own satisfaction. So we bought printers. We bought samples of all the major brands and tested them.

Our Objective Was Simple

We wanted to find that printer which had all the features you could want and yet be sold directly to you at the lowest price. We didn't want a "close-out special" of an obsolete product that some manufacturer was dumping, so we limited our search to only those new printers that had the latest proven technology. We wanted to give our customers the **best** printer on the market today at a bargain price.

The Results Are In

The search is over. We have reduced the field to a single printer that meets all our goals (and more). The printer is the SP-1000 from Seikosha, a division of Seiko (one of the foremost manufacturers in the world). We ran this printer through our battery of tests and it came out shining. This printer *can* do it all. Standard draft printing at a respectable 100 characters per second, and with a very readable 12 (horizontal) by 9 (vertical) character matrix. This is a full bi-directional, logic seeking, true descender printer.

"NLQ" Mode

One of our highest concerns was about print quality and readability. The SP-1000 has a print mode termed Near Letter Quality printing (NLQ mode). This is where the SP-1000 outshines all the competition. Hands down! The character matrix in NLQ mode is a very dense 24 (horizontal) by 18 (vertical). This equates to 41,472 addressable dots per square inch. Now we're talking ***quality*** printing. It looks like it was done on a typewriter. You can even print graphics using the standard graphics symbols built into your computer. The results are the best we've ever seen. The only other printers currently available having resolution this high go for hundreds more.

Features That Won't Quit

With the SP-1000 your computer can now print 40, 48, 68, 80, 96, or 136 characters per line. You can print in ANY of 35 character styles including 13 double width and 3 reversed (white on black) styles. You not only have the standard Pica, Elite, Condensed and Italics, but also true Superscripts and Subscripts. Never again will you have to worry about how to print H_2O or X^2. This fantastic machine will do it automatically, through easy commands right from your keyboard. Do you sometimes want to emphasize a word? It's easy, just use **bold** (double strike) or use *italics* to make the words stand out. Or, if you wish to be even more emphatic, underline the words. You can combine many of these modes and styles to make the variation almost endless. Do you want to express something that you can't do with words? Use graphics with your text — even on the same line. You have variable line spacing of 1 line per inch to infinity (no space at all) and 143 other software selectable settings in between. You can control line spacing on a dot-by-dot basis. If you've ever had a letter or other document that was just a few lines too long to fit a page, you can see how handy this feature is. Simply reduce the line spacing slightly and ... VOILA! The letter now fits on one page.

Forms? Yes! Your Letterhead? Of Course!

Do you print forms? No problem. This unit will do them all. Any form up to 10 inches wide. The tractors are adjustable from 4 to 10 inches. Yes, you can also use single sheets. Plain typing paper, your letterhead, short memo forms, labels, anything you choose. Any size to 10" in width. In fact this unit is so advanced, it will load your paper automatically. Multiple copies? Absolutely! Use forms (up to 3 thick). Do you want to use spread sheets with many columns? Of course! Just go to condensed mode printing and print a full 136 columns wide. Forget expensive wide-carriage printers and changing to wide carriage paper. You can now do it all on a standard 8½" wide page, and you can do it quietly. The SP-1000 is rated at only 55 dB. This is quieter than any other impact dot matrix printer that we know of and is quieter than the average office background noise level.

Consistent Print Quality

Most printers have a ribbon cartridge or a single spool ribbon which gives nice dark printing when new, but quickly starts to fade. To keep the printers output looking consistently dark, the ribbons must be changed quite often. The SP-1000 solves this problem by using a wide (½") ribbon cartridge that will print thousands of pages before needing replacement. (When you finally do wear out your ribbon, replacement cost is only $11.00. Order *#2001.)*

The Best Part

When shopping for a printer with this quality and these features, you could expect to pay much more. *Not now!* We sell this fantastic printer for **only $239.95! You need absolutely nothing else to start printing — just add paper (single sheet or fanfold tractor).**

No Risk Offer

We give you a 2-week satisfaction guarantee. If you are not completely satisfied for any reason we will promptly refund your purchase. The warranty has now been extended to 2 years. The warranty repair policy is to repair or replace and reship to the buyer within 72 hours of receipt.

The Bottom Line

Be sure to specify the order # for the correct version printer designed for your computer.

Commodore C-64 & C-128, Order #2200, graphics interface & cable built in.

IBM-PC and compatibles, Order #2100, plus 8' shielded cable #1103, $26.00

Standard Parallel with 36 pin Centronics connector, Order #2400, no cable

Standard Serial with RS-232 (DB-25) Connector, Order #2500, no cable

We also have interfaces and cables for many other computers not listed. Call Customer Service at 805/987-2454 for details.

Shipping and insurance is $10.00 — UPS within the continental USA. If you are in a hurry, UPS Blue (second day air), APO or FPO is $22.00. Canada, Alaska, Mexico are $30.00 (air). Other foreign is $70.00 (air). California residents add 6% tax. The above are cash prices — VISA and MC add 3% to total. We ship the next business day on money orders, cashiers' checks, and charge cards. A 14-day clearing period is required for checks.

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*=General, **V**=VIC-20, **64**=Commodore 64, **+4**=Plus/4, **16**=Commodore 16, **128**=Commodore 128

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editor's notes

We just received our first-ever Compact Disc-ROM player from North American Philips Company. Quite simply, the pending technology of CD-ROM has just become a reality, even though it's sitting here, hooked to an IBM PC, and we're anxiously awaiting the first (and only) piece of software in existence from Grolier. Over the years, we have been overwhelmed, to various degrees of sentimental eloquence, as remarkable happenings come and go. We have pattered on about everything from the first word processors for microcomputers to the rather wondrous appearance of the price breaking VIC to the present new generation computers, the Commodore Amiga and the Atari ST. In this position, we feel it is important to retain one's sense of *wonder*. Once wonder is lost, we begin to lose our ability to communicate the enthusiasm of what it is that we're all doing here.

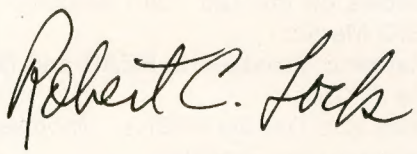
Our efforts to nurture that enthusiasm have been, at times, stretched, over the years, but invariably something happens to refresh, to evoke that tremendous, almost indescribable sense of an incredible threshold for humankind. We're pleased to report on another.

On our personal list of happenings and movings and shakings of this industry and this revolution, some have diminished in perceived importance and some have grown. We can still remember with exceptional clarity the graphic power of Atari's *Star Raiders* cartridge when we received our PROM prototype in 1979. There had *never* been anything like it in the personal computing industry. It was simply amazing. What we are trying to capture here is that sense of firstness. There have been *improvements* in graphic imagery over the years since then, but never such a quantitative leap from what had been to an entirely new strata of reality. In short, our expectations were moved, in one event, by one product, to a whole new realm of comparison. There have been others, of course, since that first viewing of *Star Raiders*. Even the recent Amiga and ST developments bring us to new thresholds. But, in a sense, even they are part-improvement upon, part extension of what was.

The CD-ROM is different. It's the kind of product-oriented event that gives you goose bumps. It's an entirely new extension of an equally new product line. It takes our common understandings and our now somewhat stereotyped expectations for the behavior of a storage device and shakes them. Here, in this room, in this small box the size of a child's record player, one can place a compact disc that will store, for access by your very own personal computer, 600 megabytes of data. That almost is beyond imagination—600 million bytes of data. The same size unit, with floppy disks, for a Commodore 1541 disk drive would require roughly 3,615 diskettes. Another way of looking at the capacity of a single CD-ROM is that (assuming an average word length of five characters) it would take a 60-word-per-minute typist, typing eight hours a day, five days a week, over 16 *years* to fill up a single disk.

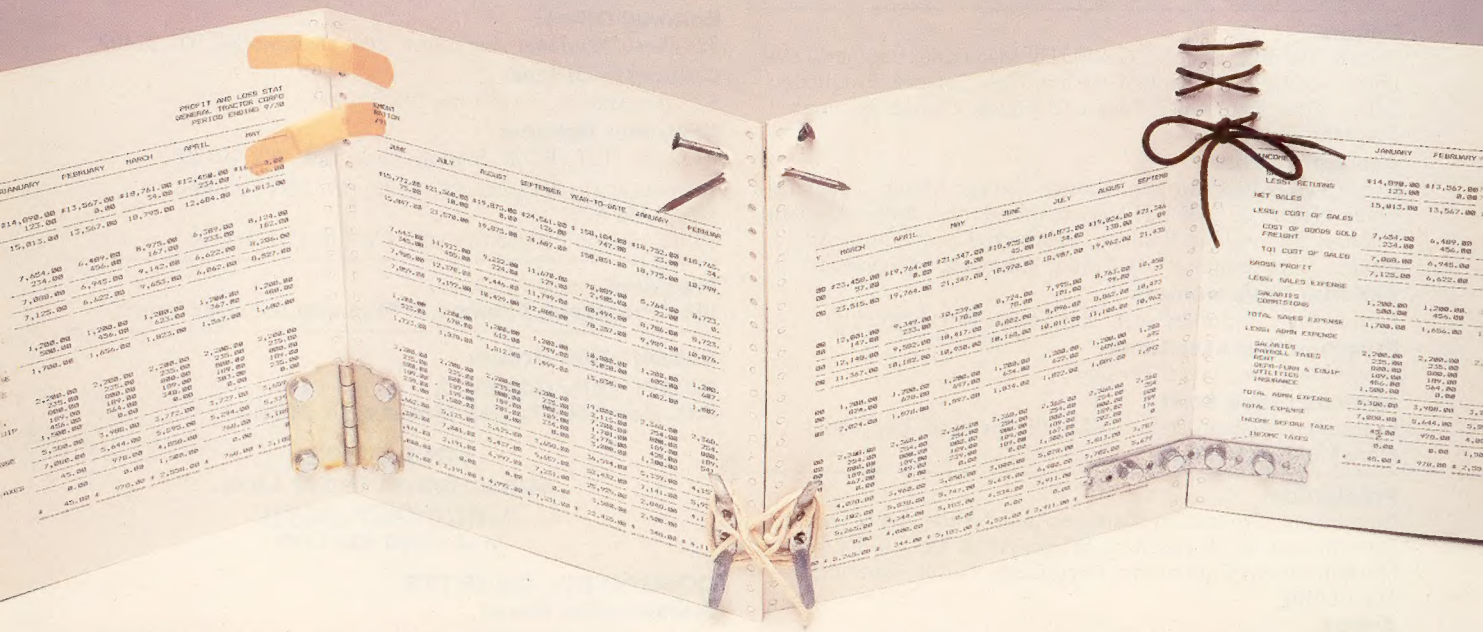
The arrival of this small, plain box from Philips has set minds racing here. CD-ROM has become, and is becoming, a sudden reality. It is reaching that crucial point where we will soon be playing with it, soon be peering into it, no longer simply reporting on it, or merely reading about it. Visions of new and greater breakthroughs crowd behind this event.

We, even now, can hardly stand the wonder of it all.

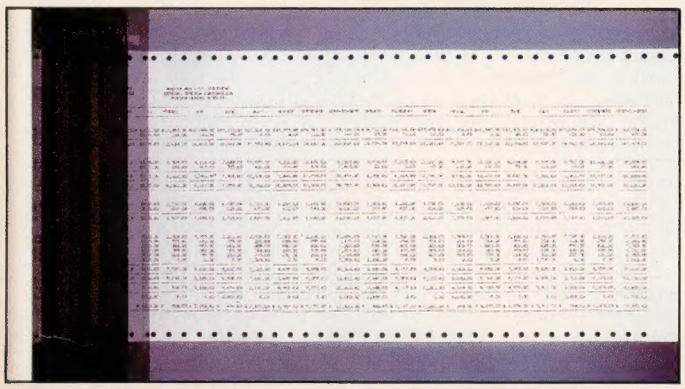


Editor In Chief

SIDEWAYS... A NEW PROGRAM THAT SOLVES AN OLD PROBLEM.



Sideways. It prints your spreadsheet sideways.



The problem with spreadsheets is they get printed the wrong way. You still have lots of stapling and taping to look forward to before your printout is ready. Now, with SIDEWAYS, you can print a spreadsheet report that's wider than your printer paper – vertically, all at one time, on one continuous page.

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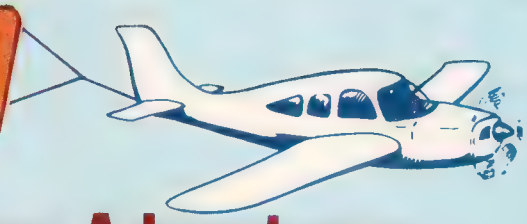

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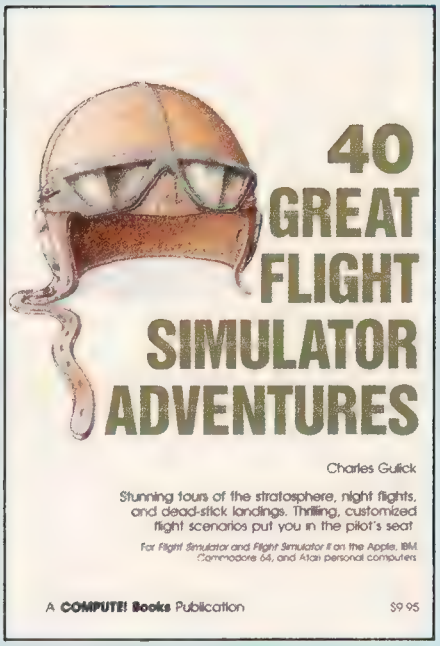
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Do you have a question or a problem? Have you discovered something that could help other Commodore users? Do you have a comment about something you've read in COMPUTE!'s GAZETTE? We want to hear from you. Write to Gazette Feedback, COMPUTE!'s GAZETTE, P.O. Box 5406, Greensboro, NC 27403. We regret that due to the volume of mail received, we cannot respond individually to programming questions.

Adjusting A Monitor

I bought a 1702 monitor for my 64, but I can barely read the letters on the screen. My neighbor has a 64 and a 1702 and the screen has perfect clarity. What could be wrong and where do I go to fix it?

Grant French

On the front of the monitor along the bottom is a control panel covered by a hinged door. If you haven't already done this, reach over to the left side of this door and pull it down. Adjust the controls marked "bright" and "contrast" until the screen becomes more readable. If that doesn't work, try switching the various RCA plugs that go into the monitor. The three rear connections provide better resolution than the two plugs on the front—there's a switch on the back that controls whether the input comes from the front or rear connections.

If neither turning the knobs nor trading plugs works, you may want to bring your computer and monitor over to your neighbor's house. Hook up your monitor to his computer and vice versa. You should be able to figure out whether the problem is the computer or monitor. There are Commodore Service Centers throughout the country; to find the one nearest you, call Commodore at (215) 431-9100.

Excessive Caution?

I have two questions. First, some of the music and sound effects programs in my owner's manual do not work. Do you know of any misprints or do you think that my computer needs new chips? Second, is it true that if you POKE or PEEK a wrong number into the 64's memory that it could cause damage to the computer?

Ron Calcagni

If a program you typed in doesn't work, either you made a typing mistake or the editors and programmers who put together the book or magazine made a mistake. It's highly unlikely that one of your computer chips is broken, especially if it's just a few programs that don't run correctly.

It's not unusual to make a typing mistake now and then. Imagine a medium-size program containing 50 lines of about 20 characters each, a total of 1,000 characters. Even if your typing accuracy is 99.9 percent, you may make a typing error. In a computer program, a single character can make the difference between a program that works and one that doesn't. Sometimes it's very difficult to find the typo, especially if you've accidentally entered a period in place of a comma, or a semicolon in lieu of a colon.

The worst that can happen to a mistyped program is that the system will lock up. To escape from a lockup, just turn the computer off and then back on. You'll lose whatever is in memory (which is why you should save a copy of the program before you run it), but nothing has been harmed. You needn't worry about a program making computer chips go bad. Nor should you be concerned about incorrect PEEKs and POKEs. A wrong POKE might make the screen go crazy or cause a lockup, but no permanent harm would be done. Don't worry about breaking your computer; the best way to learn about computers is to experiment. If the machine starts doing strange things, turn it off for a moment. The most you can lose is the program in memory.

If you've double-checked your typing and still can't find anything wrong, there may be a typo in the program listed in your book. In general, most publishing companies and software/hardware manufacturers support their products. If you write a letter to Commodore, they should be able to inform you of any corrections to programs published in their books and magazines. Likewise, if a program from the GAZETTE doesn't work correctly, write to us, indicating the program name, when it was published, the error message, and line number. If we know of corrections, we'll let you know; if not, we'll send a letter indicating that the program works. And if your ABC word processor, DEF interface, and GHI printer don't work properly together, send a letter to each of the manufacturers. At least one of them should be able to give you some answers to your questions.

When writing to a hardware or software company, give as much information as you can. Indicate the equipment you own, what exactly is going wrong, what you've tried, and so on. It's better to give too much information than not enough.

Extras Required

I am using "X BASIC" from the October 1985 issue to write a program. If I were to send it to you as a submission, would you accept it? Or would I have to write it using the regular Commodore BASIC?

Matthew Kaeser

When you're submitting a program for publication, it's safest to stick to Commodore BASIC and machine language. The appeal of a program that requires "X BASIC" is limited to readers who own the October issue and typed in the program. We assume that most readers who type in program listings own a computer, either a tape or disk drive, and a joystick or two. Although we don't automatically reject programs that need extras such as X BASIC, Simons' BASIC, the Super Expander, *light pens, Ham radio equipment, voice synthesizers, 80-column cartridges, and the like, a submission that requires additional hardware or software is less likely to be accepted than a stand-alone program.*

Noise And Randomness

What is a checksum? I have asked computer teachers and they did not know, so I am writing to you. I need to know in order to use the "MLX Machine Language Editor."

Evan Resnikoff

A checksum is a way of filtering out static, a way of foiling entropy. Let's say you call a friend in Australia and say "It's summertime, isn't it?" Because of noise on the line, she hears only "...time...is...it?" and replies, "Three o'clock." The message sent from your side was OK, but it deteriorated on its way through the phone lines and was interpreted incorrectly.

The same kind of misunderstanding can occur when computers are sending or receiving information. A wide variety of formulas are used, but the basic idea is the same. The originating computer outputs

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some numbers which are followed by a checksum. The computer at the other end adds up the numbers and checks the sum against the checksum received. If the numbers match, it sends a signal that means "OK, send more." But if they don't match, the receiving computer sends back a signal that says "Something is wrong, try again."

Checksums are widely used in telecommunications. And disk and tape drives calculate checksums when a program is being loaded. If the checksums don't match up, you receive a LOAD ERROR. If you enter programs from the GAZETTE, *you may have used the "Automatic Proofreader" or "MLX," both of which generate a checksum to help prevent typing errors. But you don't need to know how the checksum works to use MLX; everything is handled automatically. The first number on the line is the memory address where the first number will be stored. Next are the numbers that make up the program. And the last number on the line is the checksum. If it doesn't match up with the checksum generated by MLX, the line is not accepted and you're given a chance to correct the typing mistake.*

---

128 Hardware And Software

I have some questions about the 128. Is the 512K memory expansion going to be usable memory? Will software publishers take advantage of it? Do you expect someone to come out with a product to expand the screen resolution to 640 × 200? What about a program that allows the 1571 to read other CP/M disk formats?

James Jacobs

The memory expansion is not currently available, but it should be by the time this is published. Initial indications are that the memory can be treated like a RAM disk. You'll be able to load programs or data into the expansion memory and access the information there almost instantly, at speeds much faster than a disk drive. If you're curious about how you would access the memory from BASIC, look up the BASIC keywords FETCH, STASH, and SWAP in the 128 System Guide. You should also be able to PEEK and POKE there, if you use the proper BANK command first.

It's hard to predict what software publishers might do, but you can probably expect some software that allows you to use the extra memory. A workspace of 512K would be especially helpful in data-intensive business programs or adventure games that need a lot of memory for text and maps.

Higher resolution than 320 × 200 for the 40-column screen is unlikely, because it would require additional hardware and a revised operating system. Incidentally, the 80-column screen already has a resolution of 640 × 200 and you can create custom characters (up to 4 different character sets on the screen at one time) and hi-res screens.

The 1571 disk drive has the capability of reading several CP/M disk formats; it can load programs or data from Kaypro, Osborne (double density), or Epson disks. It can also read data files from IBM CP/M-86 disks, although the 128 can't run CP/M-86 programs because they're not written for Z-80 machines. The disk operating system can figure out what kind of disk is in the drive and adjust itself accordingly. Additional software to reprogram the drive isn't necessary.

The VIC Printer Problem

I own a VIC-20, 16K expander, tape drive, and MPS-803 printer. I seem to have problems with the printer not receiving characters. I often get a DEVICE NOT PRESENT error while it's in the middle of printing. It's an intermittent problem—sometimes the printer works, but most of the time it doesn't. Why does it do this? Is there a POKE or a WAIT I can use to solve the problem?

Ed Olesak

Most of the time, DEVICE NOT PRESENT means you tried to access a device the computer can't find on the serial bus. The printer (or disk drive or other peripheral) might not be turned on, or not plugged in, or not connected by cable.

Try hooking up your printer to another VIC-20; if it works, then the problem may be in your VIC. On the other hand, if the printer doesn't work with another computer, the printer may need repair. You may simply have a faulty cable, which you can test by finding another cable and testing the printer. Or you may find that turning on the computer first (or the printer) makes a difference—it shouldn't matter, but sometimes a printer or disk drive needs a couple of seconds to reset.

In other words, experiment with different configurations to discover which piece of equipment is the culprit.

But with your setup, the error might have another cause. VIC-20s have been known to act erratically when used with both a Datassette and a printer. A tape SAVE or LOAD may leave the VIC in a state where it's unable to open a channel to the printer. To find out if this is the problem, try saving to or loading from tape and then printing something. Next, unplug the Datassette, reset your system by turning the computer and printer off and back on, and try printing something without previous tape access. If the printer seems to work in this situation, but not when you've loaded or saved, you've probably discovered the problem. In the future, you can avoid the printer lockup by entering SYS 64490 after accessing tape.

A Translator's Dictionary

I need a program that works like a simple dictionary. I would tell the computer a word in one language and it would respond with the translation in another language. I would like to build a base of Italian words with their English translations.

K. Graham

The following program (for all Commodore computers) can hold as many words as the memory of the computer will allow.

```
FS 10 NW=3:DIM W$(1,NW)
KG 20 FOR A=1 TO NW
JR 30 READ W$(0,A),W$(1,A)
QG 40 NEXT
PP 50 PRINT "{2 DOWN}{RVS}E
      {OFF}NGLISH OR {RVS}I
      {OFF}TALIAN"
RH 60 GET A$:IF A$="E" THEN 90
SH 70 IF A$="I" THEN 100
JH 80 GOTO 60
EP 90 INPUT "{DOWN}ENTER ENGLI
      SH WORD";W$:L=0:GOTO 110
PA 100 INPUT "{DOWN}ENTER ITAL
       IAN WORD";W$:L=1
FK 110 F=0:FOR A=1 TO NW
QS 120 IF W$(L,A)=W$ THEN F=A:
       A=NW
SK 130 NEXT
JJ 140 IF F THEN PRINT "
       {2 DOWN}TRANSLATION IS
       {SPACE}";W$(1-L,F):GOTO
        50
BX 150 PRINT "NOT IN DICTIONAR
       Y":GOTO 50
ED 160 DATA YES,SI,BEAUTIFUL,B
       ELLE,BROTHER,PISANO
```

Presently there are only three words and their translations in the dictionary. More words can be added by entering the English word, then the Italian translation, into DATA statements. It is also necessary to change the variable NW in line 10 to equal the total number of words.

The key to the program is the two dimensional array W$, which is two words wide and NW words deep. The dimensions of the array are set in line 10, via the DIM statement. The word pairs are numbered from 1 to NW, with the English word listed under entry number 0 and the Italian word as entry number 1. To find a translation of an English word, the program searches through the 0 side of the list until it finds a match. Since the words are stored as pairs, the equivalent Italian word is right there, on side one of the list. To translate the other way, the computer searches through side one of the list and then prints the English word it finds on the other half of the list.

Problems With Screen Dumps

I typed in "Hi-Res Screen Dump" from the October 1984 issue. It works, but I have two problems.

When I print a hi-res screen on my

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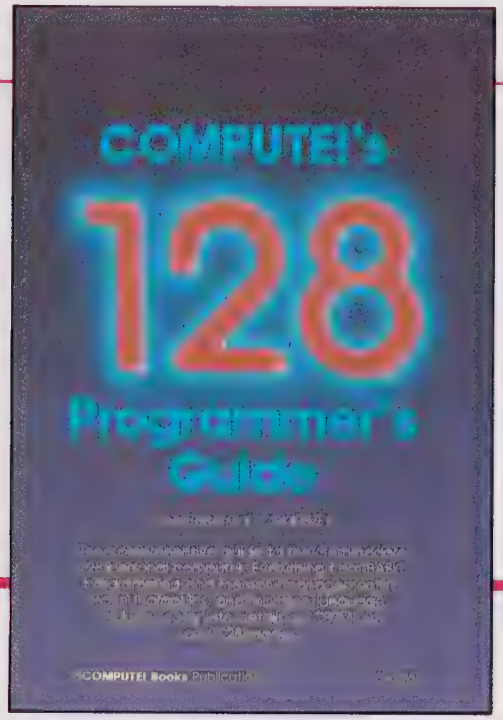

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MPS-803, I get the inverse of what is on the screen. Also, I want to print screens from commercial software. When I try to add the screen dump, the commercial program locks up.

Zack Stonich

The individual dots on a hi-res screen are called pixels, each of which can be either on or off. The color of each 8 pixel by 8 pixel section of the screen depends on the corresponding value in color memory.

Within a standard hi-res screen display there are two colors available, the foreground color for the pixels that are turned on, and the background color for turned-off pixels. Say you set the foreground to red, the background to white, and then draw a triangle on the hi-res screen. A red triangle would be displayed on a white background. Switch the colors—foreground to white, background to red—and the result is a white triangle on a red screen. Either way, the triangle is displayed in the foreground color.

In a hi-res screen dump to a black and white printer, you would want the dark screen colors to be printed and light colors not printed. But most hi-res screen dumps read the screen to determine where individual pixels are on or off. Regardless of whether the screen displays a red triangle on white or a white triangle on red, the image sent to the printer is a black triangle on white paper. If the foreground color is lighter than the background, the printed picture will appear to be reversed.

Here's a suggestion that might help. If the hi-res screen is located at 8192–16191, add this line to your program:

```
FOR J=8192 TO 16191: POKEJ
,255 -PEEK(J): NEXT
```

The screen image will be reversed, because all the on pixels are turned off and vice versa, but the screen dump will print correctly.

There's no easy answer to the second question. You probably won't be able to print screens from commercial games. Almost no games allow you to stop the program, load another program, and then resume play. Even if you could, there would always be the potential for a memory conflict. If the commercial program and the screen dump program both tried to use the same area of memory, one or the other wouldn't work correctly. What you would need is a completely transparent screen dump program.

If you're using a graphics program, you may be able to save the hi-res picture to disk. If the documentation includes information on how to load the hi-res screen back into memory (for use in your own programs), you could follow the instructions there. Once the hi-res screen has been restored, you should be able to use the screen dump program.

Reading The Directory

I am writing a BASIC program that reads the disk directory. I'm interested in how you would assign the filenames and lengths to variables.

Lorene Heffernan

The following program reads the disk's directory and displays it on the screen:

```
FC 10 OPEN 2,8,0,"$"
SK 20 GET#2,A$:GET#2,A$
KF 30 GET#2,L$:GET#2,L$:IFST=6
      4THENCLOSE2:END
DQ 40 GET#2,LB$:GET#2,HB$:LN=A
      SC(LB$+CHR$(0))+256*ASC(
      HB$+CHR$(0))
HX 50 PRINT LN;
SD 60 GET#2,A$:IFA$=""THENPRIN
      TCHR$(13);:GOTO30
RX 70 PRINTA$;:GOTO60
```

The directory file, under the name "$", can be read like any other file on the disk. Since it is a program file it should be opened with a secondary address of 0 (line 10). The first two bytes of a program file are the low and high byte of the start address; these are unnecessary for our purposes, so they're read and ignored in line 20.

Every line of a BASIC program is made up of four parts: the line links, the line number, the body of the line and an ending zero. In line 30 the line links are read in and the reserved variable ST is checked. If the end of file has been reached, the file is closed and the program ends. To use this routine in your own programs, replace the END command in line 30 with a GOTO (or a RETURN if you're using it as a subroutine).

Line 40 reads the low and high bytes of the line numbers, then calculates the value and prints it on the screen in line 50. It's really the number of disk blocks used, not a line number. But remember that the directory is treated as a program file, so the blocks used are treated as line numbers of a BASIC program.

The rest of the line is read, character by character, until the end of the line (0) is found. Once the end of the line is reached, the program prints a carriage return, to separate the lines, then goes back to line 30 and repeats the process. To assign the filenames to variables, concatenate the characters into a string after the GET#2,A$ in line 60.

Custom Characters For The 128

I have been able to redefine characters on my Commodore 64 but have not yet been able to do so on the 128. I'd like to know the equivalent addresses (such as 5372, 12288, and the keyscan interrupt) for 128 mode.

James Gowell

The following program redefines the @ symbol into a "C!" character. The program takes about 25 seconds to execute.

```
KE 10 POKE 2604,30
DJ 20 POKE 217,4:FAST
RX 30 FOR A=53248 TO 55295:BAN
      K 14:B=PEEK(A):BANK 0:PO
      KE A-38912,B:NEXT:SLOW
PH 40 FORA=14336 TO 14343:READ
      B:POKEA,B:NEXT
QQ 50 DATA 98,146,130,130,144,
      98,0,0
```

Location 2604 is equivalent to 53272 on the Commodore 64. It controls the text character dot-database address and the video matrix base address. Bits 1–3 control where the character set is found. For this example we'll put the character set beginning at location 14336. Because this is in the section of memory normally used for BASIC programs, it is prudent to protect memory by entering ***GRAPHIC1 :GRAPHIC0*** *before running the program.*

Bit 2 of location 217 controls whether character data is read from ROM or RAM. Normally this bit is set to 0, which means all character data is read from ROM. In order to create a custom character set this bit must be set to 1 by POKEing location 217 with 4.

It's not necessary to disable the keyscan interrupt; the BANK command allows you to access other portions of memory. Line 30 is used to copy the character set down from location 53248 in BANK 14 to location 14336 in BANK 0.

A much faster method to copy the normal character set to location 14336, especially if you own a 1571, is to use BSAVE and BLOAD. First, save the character set with ***BSAVE"CHARROM",B14,P53248 TO P55295****. Then, to load the characters into 14336, put* ***BLOAD "CHARROM",B0,P14336****.*

Line 40 reads in the data from line 50 and POKEs it into the area reserved for the definition of the @ symbol.

Splat Files

In the directory of a certain disk are two files that have an asterisk next to the file type (PRG or SEQ). I can't seem to load either of these programs. Why is this?

Tracy Austin

If they're sequential files, it means you did not properly CLOSE the file. If they're program files, they weren't completely saved; perhaps you removed the disk from the drive before the disk drive finished writing the file. These files marked by an asterisk were once called "poison files." Newer versions of the disk drive manuals now refer to them as "splat files."

At least part of the file is gone and cannot be recovered. Whatever was in the buffer at the time the save/write operation was terminated was not written to disk. The best thing to do with a splat file is to remove it from the disk because it can interfere with other files on that disk.

Don't scratch a splat file; use the

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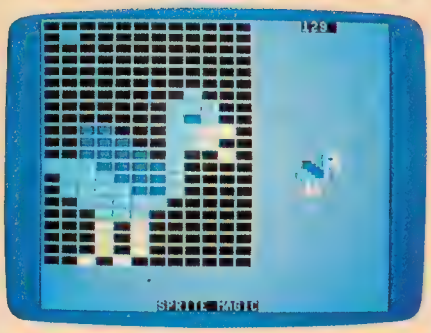

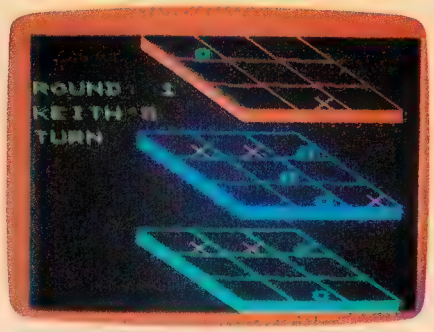

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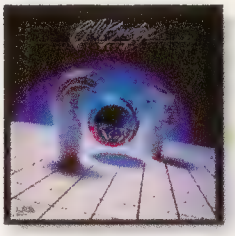

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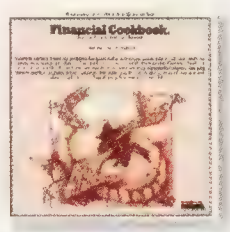

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validate command instead:

OPEN 15,8,15,"V0"

It will take some time, depending on how many files there are and how full the disk is. When the red light of the 1541 (the green light on a 1571) goes out, enter ***CLOSE 15****. 128 owners can validate a disk with the COLLECT command. What this does is clean up the block allocation map (BAM), which keeps track of which sectors are used by various files.*

Before validating the disk, you may be able to recover part of a splat sequential file with ***OPEN 1,8,2,"filename, S,M."*** *You can then read the file into memory, switch disks, and write to another disk. Make sure the backup disk is clean and contains no splat files.*

Alternate Screens For VIC, 64, And 128

I believe I have discovered a way to move the screen of the VIC-20 around in memory. I first protect the top 512 bytes of memory with POKE 56,28. Next, POKE 648,28. This moves the start of the screen from 7680 to 7168, although you can't see what you type. If I blindly type 648,30, the regular screen comes back, and PEEKs to 7168–7673 show the screen codes of the characters I typed. In theory, you could have two (or more) screens by toggling back and forth with POKEs to 648. How would you send the other screens to the TV screen? Can it be done in BASIC, or do you need machine language? This could be a valuable aid to programmers.

David Owens

Your discovery is not brand new, but you're correct in saying that it can be very useful. Over four years ago, one of our magazines published an article by Jim Butterfield about alternate screens on the VIC. It was subsequently republished in COMPUTE!'s First Book of VIC, *which is still in print if you'd like to read more about alternate screens.*

The technique of switching between screens is often called "page flipping," and it's a popular animation method on both the Atari and Apple eight bit computers. The basic idea is that you draw a picture on the hidden screen and then do a POKE or two to instantly change the display. Then draw the next frame on the other screen (previously visible, but now hidden) and so on, flipping back and forth between pictures.

*Machine language is not necessary; you can do it all in BASIC. There are three areas you need to POKE to get to an alternate screen on the VIC. You've discovered one of them, location 648, which the operating system uses to keep track of where the screen starts. On an unexpanded VIC, if you PEEK 648, you'll see a 30. This means page 30, which translates to 30*256, or memory location 7680. If you POKE 648 with a 28, the screen is moved to 7168 (28*256), as you've noted. So if you PRINT, or LIST, or even just press keys, BASIC stores the appropriate screen codes to the new screen at 7168–7673.*

But even though BASIC thinks the screen is at 7168, the VIC chip which is responsible for actually displaying the screen is still looking for the screen at 7680. You have to POKE 36866,22 to switch to the new area (see the VIC Programmer's Reference Guide *for more about how locations 36866 and 36869 determine where the VIC chip sees the screen). Also, when you change the screen on the VIC, color memory moves to the alternate area, so you have two screens and two areas for color memory.*

Those two POKEs enable the alternate screen. But if you want to use the new screen in a program, you should also adjust the line link table. When you enter a line that occupies more than one screen line, or PRINT a line that overflows to the next line, the two physical screen lines are said to be "linked." The line link table at locations 217–240 keeps track of which lines are linked.

So, after protecting memory with POKE 56,28, you can enable the alternate screen on an unexpanded VIC with the following line (type it in as a single line):

```
POKE648,28:POKE36866,22:FORJ=217TO
228:POKEJ,156:POKEJ+12,157:NEXT
```

The POKEs above put the new screen at 7168. To go back to 7680, use this line:

```
POKE648,30:POKE36866,150:FORJ=217TO
228:POKEJ,158:POKEJ+12,159:NEXT
```

The principles are the same for the 64, but some of the memory locations are different. Within the 64K of memory, there are four video banks of 16K each. Assuming you stick with the default value (bank zero), you're limited to putting the alternate screen into locations 0–16383. A screen needs 1000 contiguous bytes of memory and must start on an even 1K boundary. Available locations are 1024, 2048, 3072, and so on. Because BASIC programs start at 2048, it's essential that you move the start of BASIC up. You could move it to 16384 by entering POKE 642, 64:SYS58260.

*Location 648 performs the same function on both the VIC and 64. It's the starting page of screen memory, so to put an alternate screen at 2048 on the 64, you would POKE 648,8, because 8*256 is 2048. For other alternate screens, divide the starting address of the screen by 256 to find the page number.*

You also have to tell the VIC-II chip where the screen starts with a POKE to 53272. Bits 0–3 point to the current address of the character set, so they must remain the same (unless you've created a custom character set). Bits 4–7 point to the beginning of screen memory. If you wanted to move the screen to 2048, you would have to divide by 1024 to find that it's screen number 2. Multiply that number by 16 to get 32. Then enter this line: ***POKE 53272, 32OR(PEEK(53272)AND15).***

To fix the line links, you could clear the screen after entering the POKEs to 648 and 53272. Or, take the number POKEd into 648 and add 128 to it. POKE this number into locations 217–223 (for example, POKE 648,8 puts the screen at 2048, so you would POKE locations 217–223 with 136). Add one (136+1 is 137) and POKE that number to 224–229. Add one again (138) and POKE it into 230–236. Add one more (139) and POKE it to 237–242.

The 128 is very similar to the 64, but again the POKEs are different. The regular screen of both is found at 1024. But on the 128, the next available section of memory begins at page 32 (location 8192, part of the area used by BASIC). To move the start of BASIC up, enter GRAPHIC1 :GRAPHIC0.

The equivalent of the 64's location 648 is 2619, and the equivalent of 53272 is 2604. The formulas to change screens are the same; to move the 128's screen to 8192, you would enter this line:

```
GRAPHIC1: GRAPHIC0: POKE2619,
(8192/256): POKE 2604, (PEEK(2604)
AND15)OR((8192/1024)*16)
```

Note that it's not necessary to adjust the line link table on the 128.

Dice And Coins In Machine Language

How do you create random numbers in machine language?

Steven Swartzlander

One method for finding a random number would be to call the BASIC RND routine and then read the registers at 139–143 (on the VIC and 64). There are two problems with this approach. First, ROM calls can disrupt the current values in the A, X, and Y registers, so you would have to save their current values before going to the ROM routine. Second, the RND function returns floating point values in the range 0–.99999999 and such numbers follow definite patterns.

The best way to generate random numbers, at least on the 64 and 128, is to use the SID chip. Store an $FF into $D40F (to set the frequency of voice three to a very high value), store an $80 into $D418 (to turn off voice three), and then put an $81 into $D412 (to turn on the noise waveform). Then, any time you need a random number, read the SID register $D41B, which is the output of the third voice. Noise at a high frequency changes very quickly, and you'll find that you receive numbers from 0 to 255 in a very random pattern. You can then use ANDs or CMPs to change the values to the appropriate size.

COMMODORE 64/128K

CHARTBUSTERS

Super

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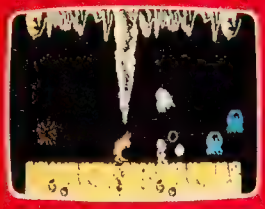
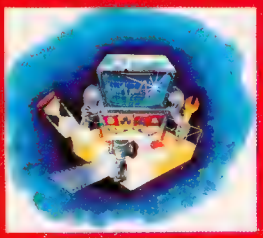


UNDERWURLDE

Beware

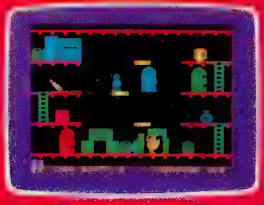
All you need is there to take
Locate the weapons, then to make
A journey on if you would dare
To find the devil in his lair
The long dark palace, seek you will
The gems your pockets will not fill
Tho' energy they'll make you fast
And gargoyles then you will get past
Up and up, the journey's slow
So down is first the way to go

The old travellers' words still singing in my head



WILLOW PATTERN

The beautiful Princess Koong-Shee is being forced to marry a merchant, Ta Jin against her will. She really loves a clerk, Chang, who's only hope is to force his way to the Mandarin's palace against terrible odds and help her to escape. Now play on...



BOOTY

Well shiver me timbers and splice the mainbrace and pass the grog, me hearties. Here be the greatest pirate adventure of them all, aboard that scourge of the Seven Seas – the dreaded Black Galleon. Feast yer eyes on the BOOTY-ful treasure stored in 20 holds. There be pirates, parrots and fun galore. If you don't like it, matey, we'll hang you by the highest yard-arm!!!

SABRE WULF

The Warning

Thy path is long so tread with care
Beware the wulf and pass his lair
Danger threatens all around
So take ye from this hidden mound
To free thee from this sunken gate
By way of cave or meet thy fate
An amulet to seek thy will
'Twas split by quad and hidden still
Pass the keeper wrought with hate
To gain an entrance to the gate
The pieces lost must thee amass
For if no charm then none shall pass

CHIMERA

Investigations have traced the source of erratic radio signals to a giant alien vessel, orbiting the Earth high in the exosphere. That the craft is hostile, there is no doubt; somebody will have to go aboard and find out how to eliminate the threat

CYLU

Greetings Cylu, Warrior King, to the land of Evol. Our people need a new leader to make us great again. He must be agile, and show that he is wise and strong, and so we have devised a test. If you pass, you will prove that you are worthy. If you fail...

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The Winter Consumer Electronics Show

Higher than expected sales of both the Commodore 64 and 128 computers in late 1985 gave particular significance to the list of new Commodore products introduced at this year's Winter Consumer Electronics Show. As you'll see in this CES report, the 128 is a genuine "baby boomer," and there's plenty of life left in the 64.

Lance Elko, Editor

Despite the conspicuous and surprising absence of Commodore, the 1986 Winter Consumer Electronics Show (CES) was not a disappointment. CES, held twice a year—January in Las Vegas, and June in Chicago—is the largest trade show in the U.S., and this year's winter event attracted well over 100,000 people, one of the highest attendance figures ever.

In contrast to shows of recent years, however, home computers had a significantly smaller presence among the hundreds of consumer electronics displays. Atari was the only major computer manufacturer there—showcasing its 520 ST computer, which was announced at last winter's CES and has lately been selling very well. Audio and video consumer products—VCRs, compact disc players, video cameras, satellite dish systems, and so on—were there in force, often generating excitement reminiscent of the home computer displays at past shows.

Although Commodore had no official presence at CES (for the first time since it began manufacturing computers), several key company representatives were on hand to talk to the computer press and to scout the show. When asked about Commodore's absence, one official noted that Commodore had its Amiga computer dealers already in place and did not have ready the array of new products that it will announce in June (at the Summer CES) for the Christmas '86 selling season. However, another reason for Commodore's absence may be related to budget. It's certainly no secret that Commodore struggled in 1985. Throughout the year rumors circulated of impending bank loan restructurings (and by late 1985, Commodore was technically in default on some bank loans). These rumors were fueled by reported losses, the most sizable of which was in the fourth fiscal quarter (ending June 30). Although Commodore had expected to report a

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RINGS OF ZILFIN™ adds unprecedented realism to fantasy gaming with its superb graphics. The fully animated scrolling screen grants you step-by-step control of the action.

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If there are no convenient stores near you, VISA & M/C holders can order these $39.95 games by calling **toll-free 800-443-0100, x335.** To order by mail, send your check to: **STRATEGIC SIMULATIONS, INC.**, 883 Stierlin Road, Building A-200, Mountain View, CA 94043. (California residents, add 7% sales tax.) Please specify computer format and add $2.00 for shipping and handling.

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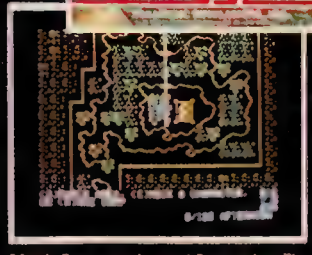

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RINGS OF ZILFIN includes graphics routines from Penguin Software's Graphics Magician®.
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KEY MASTER

One of the easiest-to-use, most powerful disk backup program ever written for the 64. Working with the 1541 or the 1571 KEYMASTER is like getting two copy programs for the price of one. Its main feature comes with 50 keys that unlocks protected disks by ELIMINATING the protection scheme originally written on the disk.
Once one of the KEYMASTER'S KEYS has unlocked a disk, the program can generally be **FILE COPIED** onto another disk (also making the program compatible with non-1541 drives.)
In addition to the UNLOCKING KIT it contains a powerful yet easy to use general purpose copier for the programs not listed as a key.

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- **FAST** full protected - disk GCR nibble copier works in only 75 seconds!
- **FAST** full unprotected - disk copier.
- **FAST** 10 second disk formatter.

With Two 1541:

- **FAST** file copier - up to 6 times faster!
- **FAST** full protected - disk GCR nibble copier works in only 37 seconds!
- **FAST** full unprotected - disk copier.

•• **50 KEYS** for popular programs will be provided on the first KEYMASTER disk. Frequent updates of 25 to 50 additional KEYS will be available periodically. (No original disk return required for updates!).

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$10.00 for update disks
KEYMASTER created by Jim Drew

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- A high-speed loader, high-speed verify, disk drive no-head-rattle routine (1541 drive) and a BASIC UNNEW ROUTINE (MSD drive) have replaced the Datasette tape routines.
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- Unlike the older, cartridge-style fast loaders, no ports are tied up at the rear of your computer, the screen is not blanked during loading and there is no wear-and-tear on the game port.
- For maximum convenience and performance, MAGNUM LOAD is installed DIRECTLY in the circuit board. Generally, a socket has already been provided to make the operation easy, but occasionally some soldering may be required.
- Now you can give your 1541 disk drive "1571 speed."

The chart below compares ACTUAL MEASURED loading times.

PROGRAM	STAR DOS	REGULAR LOAD	MACH 5	FAST LOAD	MAGNUM LOAD
Pitstop II (EPYX)	?	144 sec	43 sec	41 sec	31 sec
Music Shop (BRODERBUND)	?	105 sec	105 sec*	105 sec*	21 sec
Hitchhiker's Guide to the Galaxy. (INFOCOM)	?	70 sec	70 sec*	**	68 sec*
On-field Football (GAMESTAR)	?	159 sec	66 sec	63 sec	56 sec
EASY FINANCE I (COMMODORE)	?	58 sec	13 sec	13 sec	11 sec

* = Will not fast load — defaulted back to regular load.
** = *Failed to load at all.*

FIVE VERSIONS OF MAGNUM LOAD ARE AVAILABLE TO FIT ANY NEED.

VERSION	APPLICATION	PRICE
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B	C64 and one MSD drive (single or dual)	$24 95
C	C64, one 1541 drive AND one MSD drive (switchable)	$29.95
D	C128 computer and one 1541 drive***	$24 95
E	C128 and one MSD drive (single or dual)***	$24.95

*** = Fully compatible with 128 & CP/M modes. Cartridge versions MUST be UNPLUGGED to access 128 & CP/M modes!

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MAGNUM LOAD created by Jim Drew

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Shadow a disk while it loads, then read an exact list of:

- Track, sector, ID, check sum, drive status
- High and low track limits
- Density use on each track
- Half tracks that are used
- Command recorder shows commands that were sent to 1541 while program was loading
- RAM recorder records custom DOS

Shadow-scan any disk, then read exact list of:

- Valid tracks, half tracks, partial tracks and segments
- Sync mark link, header block links and data block links
- Track to track synchronization

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*Requires Shadow

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Highly sophisticated and integrated piece of hardware that turns you 1541 into something you've always wanted.

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- Half track indicator
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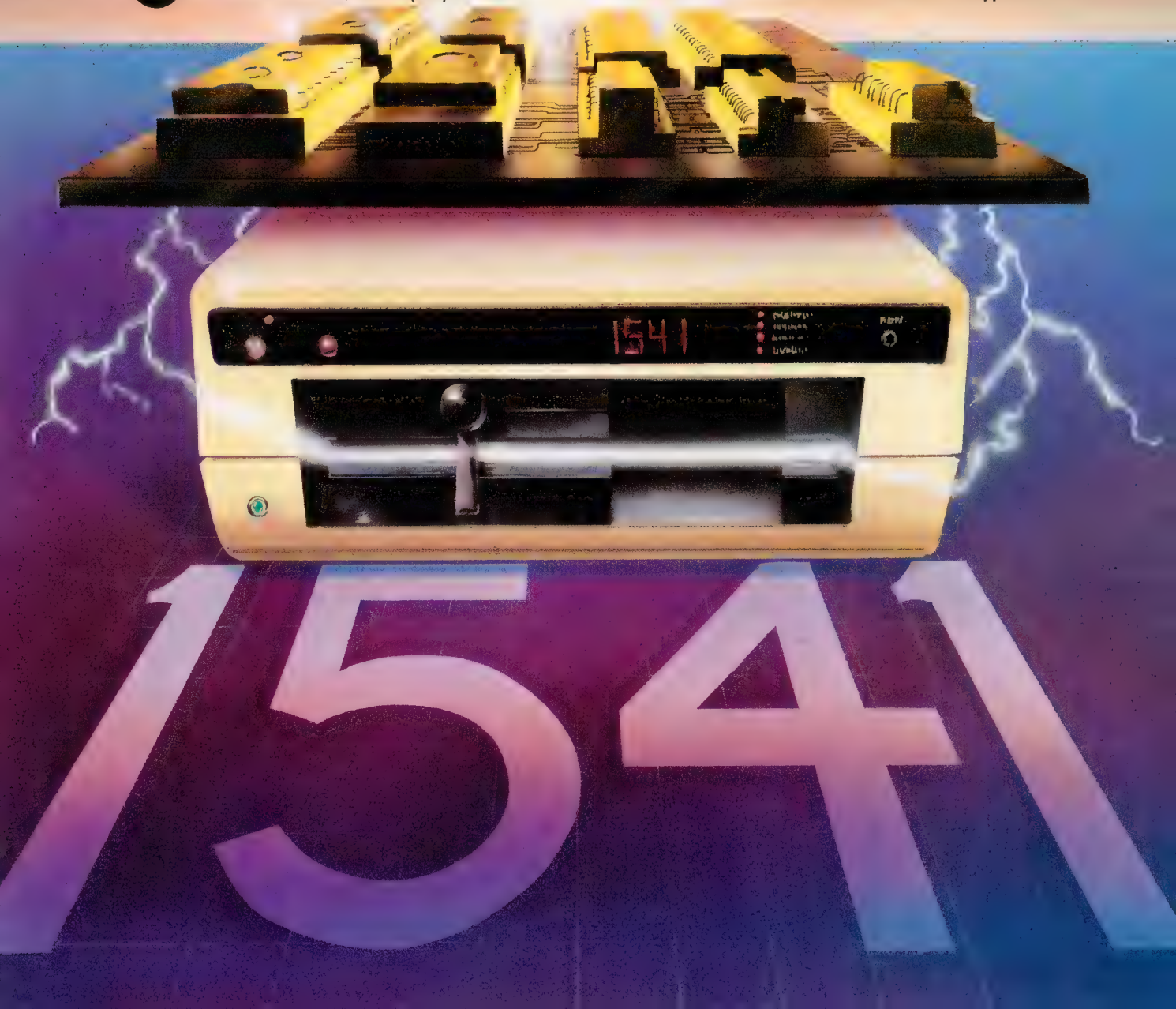


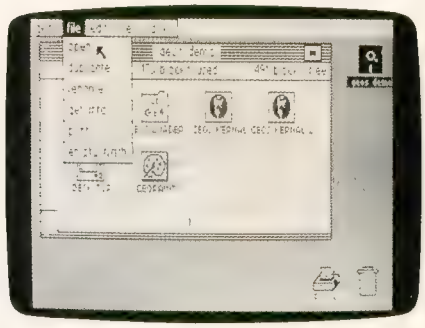
profitable second quarter (the last three months of 1985), company officials announced following CES that the shut-down of their Costa Mesa semiconductor facility had created a loss for that period.

Another key element in the 1985 Commodore financial picture was the expense of launching two new machines, the Amiga and the 128. Despite a tough year, however, the 1985 total sales figures, according to Commodore, paint a bright picture: approximately one million 64s, almost 500,000 128s, and about 20,000 Amigas sold. The 128's sales totals surprised everyone, including Commodore, as did the continuing resurgence of the 64. The latter, Commodore's venerable bread-and-butter machine, was thought dead in terms of new sales, but was resurrected in the production lines several times during the course of the year, even as late as December. As one Commodore official described it, the 64 is "the Lazarus machine."

Like Commodore, many major software companies, once prolific with titles and highly visible at CES, were absent. Others were there, but with fewer packages than in recent years. What's apparent is that software publishers have become more selective in their offerings: Competition is stiffer, consumers are more selective, and general consumer demand is down. Although this might not bode well for the industry, the choices among higher quality products do benefit the consumer. A common complaint of the past few years—trying to select from hundreds, even thousands, of titles—seems sure to subside.

While many of the traditional—if that term applies at all in this industry—software houses are still solid and producing quality packages, there are a few newcomers that will draw a lot of attention in 1986.

One of the most impressive new software items announced at CES was from a new company. *GEOS* (Graphic Environment Operating System) from Berkeley Softworks (Berkeley, CA) is a software-based operating system that will give 64 owners the opportunity to own a second computer. It transforms the 64 user interface into an icon-based Macintosh-like environment (although it's not at all a Macintosh clone). *GEOS* is fast and extremely powerful. Access to the 1541 disk drive is intensive, but so fast and transparent that you'll probably think you also have a new disk drive. (Data transfer rates are five to seven times faster.) Included with *GEOS* are two integrated applications: *geoWrite* and *geoPaint*. With *geoWrite*, a word processor, you can create documents on screen in the exact format of how the printed version will appear. A variety of character fonts are included. The *geoPaint* graphics editor has screens and cut-and-paste abilities similar in operation to *MacPaint* on the Macintosh.

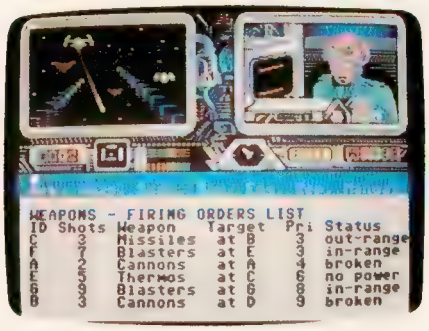


GEOS *from Berkeley Software gives the 64 a brand new operating system.*

With a new and faster disk operating system, quicker manipulation of large files is possible. With *geoWrite* and *geoPaint*, for example, you can store and display 8½ × 11 inch documents in 80-dots-per-inch resolution (a single page in *geoPaint* can be as large as 70K). The new DOS allows for fast control of files even at this size.

Like the Mac, *GEOS* allows you to view, load, copy, and delete files by moving a pointer icon. Input is with a joystick or mouse. Several additional products that support *GEOS* are in the works. Berkeley has designed *GEOS* to be an open-ended system; the technical specifications are available to software and hardware developers. This means that we could see various support products at a later date. Commodore is also working with Berkeley to build third-party software support for the system. *GEOS* is available and sells for $59.95. A *GEOS* programmer's reference manual will be available this spring.

Another newcomer to the home software market is Accolade. Established by two Activision cofounders only a year ago, Accolade introduced a number of high-quality, reasonably priced entertainment packages in 1985 (including *Hard-Ball, Law of the West, Fight Night,* and *Dam Busters*).


WEAPONS - FIRING ORDERS LIST
ID Shots Weapon Target Pri Status
C 3 Missiles at B 3 out-range
F 7 Blasters at E 3 in-range
A 2 Cannons at A 4 broken
E 5 Thermos at C 6 no power
6 9 Blasters at 6 8 in-range
B 3 Cannons at D 9 broken

Psi-5 Trading Co., *a new entertainment package from Accolade, has excellent graphics and playability.*

At CES, Accolade announced *Psi-5 Trading Co.*, an innovative entertainment package for the Commodore 64. *Psi-5* is a futuristic adventure in which you, the captain of a space freighter (the Psi-5 Trading Company) must select five crew members from 30 resumes of applicants. Each character has special skills and a unique personality. The ship's mission is to travel to a distant frontier colony and rescue the inhabitants from alien invaders. Success in the game depends on your relationship with the crew, and how quick and how well you learn the nuances of their personalities. You'll need to understand each crew member to predict his or her performances in various situations. As with earlier Accolade offerings, graphics are excellent. The game is light and humorous at times, intense and dramatic at others. It's available for $29.95.

Cardco, a veteran in the home computer market, introduced a number of innovative products. StealthTec, the name given to a "new program-interrupt technology," is a line of transparent cartridge-based utilities for the Commodore 64 and 128. The first two products in this line were introduced at CES. *Freeze Frame* is a screen dump utility that, when signaled by the user, sends whatever

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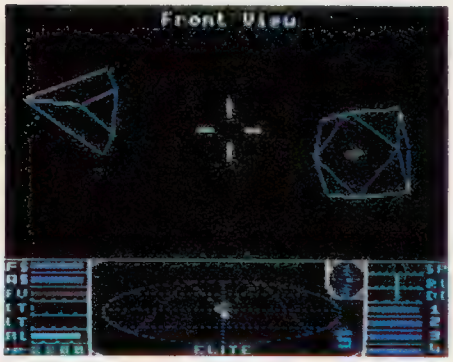

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is on the screen to the printer. Cardco says that it works with *all* programs, no matter what memory locations they use. To access one of the StealthTec utilities, just press the RESTORE key. At the show, there was no software incompatible with the product. StealthTec supports any printer which emulates the Commodore 1525, or any Epson- or Okidata-compatible printer. Suggested retail price is $49.95.

The second StealthTec product announced is temporarily named *Side Saddle*. This product, modeled after the popular IBM PC utility *Sidekick*, is to be released shortly after negotiations are finalized concerning the use of the product name with *Sidekick* publisher Borland. Like its possible namesake, this product offers instant access to a calculator, appointment calendar, telephone directory/dialer, memo writer, a screen dump utility, DOS functions, and more. Cost is $69.95. Initially, the StealthTec programs will be offered for the 64. Commodore 128 versions will follow.

Cardco also announced three models of the Cardco Hard Disk Drive for the 64 and 128. The 5-megabyte ($599.95), 10-megabyte ($899.95), and the 20-megabyte ($1,299.95) models will offer vastly improved speed and memory capacity to Commodore owners. Once a program is loaded into memory, pushing one button writes and stores that program to hard disk. Cardco noted that a full-function spreadsheet loads from the hard disk into memory in 2.5 seconds. The Commodore 64 versions are expected to ship in late March, the 128 versions shortly after.

While Commodore 128 owners have had the benefit of lots of software that runs on the built-in 64, there haven't been a lot of programs that take advantage of 128-specific features. The good news from CES is that there's more available and more on the way. And most of it looks to be good.

Cardco unveiled the CP/M-based Personal Productivity Series, the first three products of which are now available. *Personal Accountant* is a budgeting program for small business or household needs. It includes a financial planner and record book for checking and savings accounts, expenses, and family or business budgets. *Personal Inventory* records personal net worth, including categories for personal possessions, stocks and bonds, cash, real estate, retirement programs, and other assets or liabilities. *Personal Time Manager* is a personal and small business appointment calendar which can handle up to 26 events for up to 240 people. It also flags time conflicts, prioritizes, and can print out daily, weekly, or monthly schedules. Each retails for $39.95.

Access Software introduced the Mach 128 cartridge, a fast-load and DOS enchancement package for either the 1541 or 1571 disk drive. Program loads are up to 700 percent faster with the 1541, and "burst speed" loads are possible with the 1571. Features include a reset switch for warm starts and a switch for selecting 128 or 64 mode. Also included are short-hand DOS commands, 40- and 80-column

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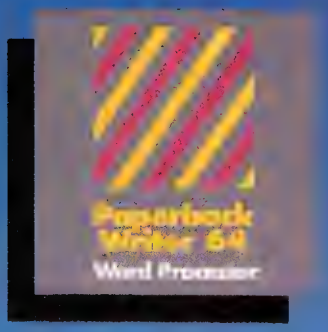

PW 128/64 Dictionary also available at $14.95 (U.S.)

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The price? It's as low as you'd expect for a line of software called 'Paperback'. Suggested Retail Price for the 64 Software is $39.95 (U.S.) and $49.95 (U.S.) for the 128. Any of the 64 products may be upgraded to their 128 version for $15.00 (U.S.) + $3.00 shipping and handling. (Available to registered owners from Digital Solutions Inc. only.)

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Paperback Writer 128 and 64 are now available in French.

screen dumps, and *Disk Organizer*, a disk-based utility for cataloging and organizing disk libraries. Suggested retail price is $49.95.

Also new from Access is *The Development System*, a macro assembler/text editor. This utility allows you to create and edit BASIC program or text files for use with the assembler. Features include assignable function keys, auto line numbering, renumbering, the ability to find or change text strings, file appending, fast forward and reverse screen scrolling, and *Spritemaster*, a sprite generator/animator for use in assembled programs. *The Development System* works on the 128 in either 128 or 64 mode, as well as on the 64, with the 1571 or 1541 disk drive. The price is $79.95.

Timeworks introduced *Partner 128*, a collection of desktop organizational utilities on cartridge, including a calculator, memo pad, appointment calendar, typewriter (for small typing jobs like labels, memos, and forms), address book, phone book, envelope addresser, and screen dump. Suggested retail price is $59.95. The 64 version—*Partner 64*—is available for $49.95. Another new 128 product from Timeworks is *Sylvia Porter's Personal Financial Planner*. Previously available in a 64 version, this product takes advantage of the 128's 80 columns, 128K memory, and numeric keypad. The price is $59.95.

For those 128 owners using a standard monochrome or color monitor, Batteries Included now has available the C128 Monochrome Adaptor. This $7.98 product provides a readable 80-column display on non-RGB monitors, such as the Commodore 1701 or 1702.

Much of the new software for the 64 is in the entertainment category, although several packages for music, personal productivity, and education were announced. Here's a rundown of what's new for the 64 listed alphabetically by publisher.

• **Access:** *Leader Board, The Pro Golf Simulator* features impressive 3-D graphics and animation. A highly detailed and comprehensive golf simulation, *Leader Board* is designed for one to four players. It features three play levels and handicapping. Club choice, distance, wind, terrain, and other variables make the game a challenge. Price is $39.95.

• **Electronic Arts:** *Amnesia*, EA's first-ever text adventure, is a mystery written by Thomas M. Disch, award winning science-fiction and mystery author. The story begins with the player's character waking in a strange room in a Manhattan hotel. He has no clothes, money, or memory. As the adventure unfolds, it reveals a rather complicated past life: A strange woman wants to marry him, someone is trying to kill him, and Texas wants him for murder. The goal is to discover your player's identity and solve his problems while protecting him from elimination.

EA's other new offering is *Lords of Conquest*, a conquer-the-world strategy game that can be compared to the popular board game *Risk*. There are 20 built-in maps: one like *Risk*'s, continents, historical maps (like the Roman Empire), computer-generated random maps, or ones you design

COLOSSUS is the most complete chess program available for the CBM™ 64/128 and APPLE™ 2 Series, written using the very latest techniques by a computer chess programmer of eight years experience. It has the widest range of true features available, including some never before implemented on *any* home computer chess program.

COLOSSUS has a perfect understanding of *all* the rules of chess, including under-promotions, the fifty move rule and all draws by repetition. It can handle standard mates; including the very difficult King, Bishop and Knight versus King.

COLOSSUS also offers the choice between the usual two dimensional flat board display or the new three dimensional real life board which allied to optional joystick control makes it clear and easy to use. It comes with a comprehensive instruction manual and is easily the best chess program for casual and serious players alike.

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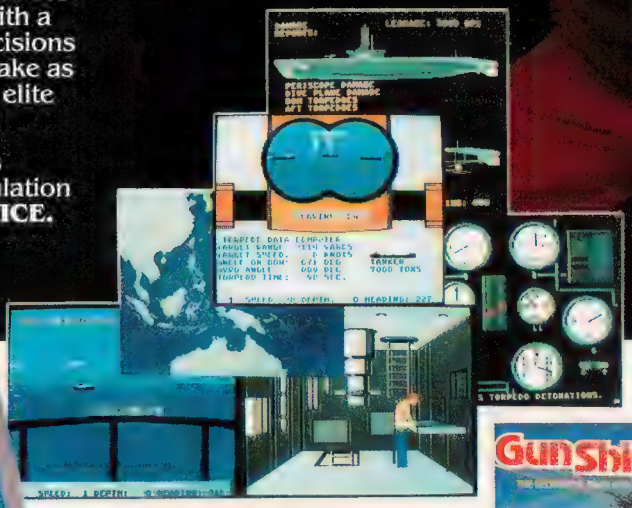

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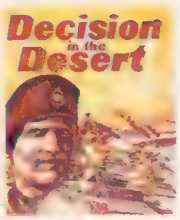

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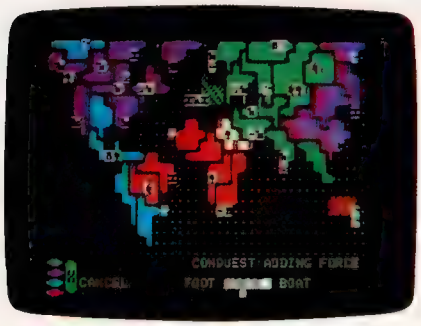
yourself. *Lords of Conquest* includes four complexity levels, and offers a multi-player or one-player (against the computer) game.



Lords of Conquest *from Electronic Arts, a* Risk*-like strategy game, offers 20 built-in maps, four complexity levels, and the choice of a multi-player or one-player (against the computer) game.*

Both *Amnesia* and *Lords of Conquest* will be available this spring. Each is priced at $32.95.

•Firebird: This British software publisher, highly successful in Europe for the past 18 months, has recently entered the U.S. market with the excellent strategy-and-action game, *Elite*. (See the review elsewhere in this issue.) New products introduced at CES for the Commodore market include *The Concise Music System ($39.95)* and *The Advanced Music System ($79.95)*, two icon- and menu-based music composition and editing programs, which also include a synthesizer module for creating and modifying sounds generated by the 64's SID chip, and a sequencer module that allows real-time mixing. *The Advanced Music System* adds a linker, which allows music files to be chained to produce full-length compositions, and a printer function, so notation (and lyrics) can be printed out.

Also introduced was *Colossus Chess IV* ($34.95), a computer chess program that reportedly has beaten Hayden's *Sargon III* and Psion's *Chess;* and a "Super Silver" line of top British entertainment packages. The first 12 titles are being released on "flippies," floppy disks that have one program on each side. Each disk costs $19.95.

•Mastertronic: Best known for its low-priced ($9.95) entertainment software from Great Britain, Mastertronic is introducing the *SkiWriter* word processor for $15. *SkiWriter* was originally a $69.95 combination telecommunications/word processing cartridge from Prentice-Hall that received excellent reviews when first introduced. The Mastertronic version is disk-based and does not include the telecommunications (terminal) program. In addition, a 128 version of this package, using the full 80 columns, should be available by the time you read this. Mastertronic is also producing *BusiCalc*, a spreadsheet, and *Instant Recall*, a filing system, both at equally low prices.

•MicroProse: Two new products from this simulation software publisher are *Conflict in Vietnam* and *Gunship*. *Conflict* is a realtime, historically based simulation in which you command either the U.S. forces or the Viet Cong. You control guerrilla warfare, air power, air mobile infantry, and artillery. Five separate games are included. These can be played in historical order from early French involvement through the fall of Saigon, or you can play any one scenario. The game is available for $39.95.

Gunship, *a new 3-D helicopter simulation from MicroProse, puts you in the pilot's seat of a high-tech, state-of-the-art helicopter.*

Gunship is a 3-D helicopter simulation in which you pilot an AH-64 Apache Gunship, a high-tech state-of-the-art attack helicopter. *Gunship* requires flying skill and the ability to accomplish aerial combat missions. Seven different missions are included. Suggested retail price is $34.95.

•Springboard Software: Springboard announced that its bestselling program *The Newsroom* is available for the Commodore 64 at a suggested retail price of $49.95. *The Newsroom* is a personal publishing package, giving the user all the tools necessary to put together an illustrated newsletter. Its companion piece, *Clip Art Collection, Volume 1*, contains 600 additional pieces of art, and retails for $29.95.

•subLogic: *Football* is a one- or two-player action game with an innovative approach. You field a team from a large portfolio of fictitious pro players, each with a unique background and set of skills. Descriptions are often humorous and highly entertaining. All 11 players from each team are animated with each play. The price, not yet announced, is expected to be under $40.

Whole Brain Spelling teaches a method for learning how to spell. This product comes in various versions: General, Medical, Scientific, Business, Fairy Tale (words from Grimm's and other fairy tales), and A Child's Garden of Words (for ages 5–9). Each version includes 200 ten-word lists organized in order of increasing difficulty. Suggested retail price is $34.95 each.

For additional information on products introduced at CES, see "News And Products" elsewhere in this issue. For more details on products mentioned in the preceding article, contact your local dealer or write:

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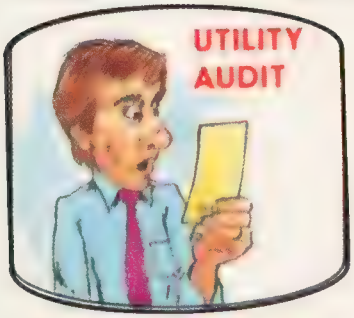

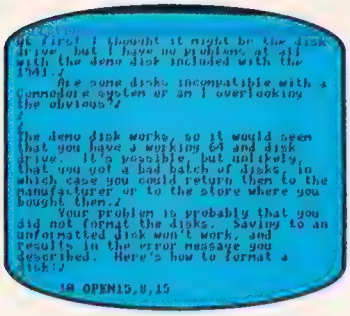

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Five Steps
To The Right Printer

Kathy Yakal, Assistant Features Editor

The printer market has not yet experienced a shakeout like other areas of the home computer industry. Printer manufacturers have continued to expand their lines, and a few new companies have entered this area in the past year. So if you still haven't bought a printer, or would like to upgrade to a more sophisticated model, you have more options than ever. Here are some tips that may help you make a more thoughtful choice.

Your approach to buying a printer will probably depend on whether you're a first-time buyer or a printer owner looking to upgrade. If you've never owned a printer, you may find that there's more to consider than you first thought. If you already have a printer, you probably have a good idea of what features you'd like to have, but may still want to go into your dealer armed with a list of questions.

One thing to be very clear about when you begin shopping is how you plan to use the printer. The list of specifications for each unit is meaningless unless you know what you want the printer to do. Some printers may be able to do everything you want and much more; if you think your applications will expand over the next few years, it may be worth the extra expense. If not, you'll probably be able to find a less expensive printer that will suit your purposes—especially given the tremendous number of printers available these days.

Here's a rundown of the kinds of things to think and ask about when you're shopping for a printer.

Ease Of Use

This may be the most important consideration in choosing a printer. As computers continue to support more general interest applications, more people without technical backgrounds are buying them. And when it comes to buying a printer, these people want something that's easy to set up and use.

Whether or not you're one of these people, ease of use will probably be a strong consideration when you're shopping for a printer. Many factors are involved here.

Set-up. What's involved in getting the printer correctly interfaced to your computer and ready to operate? Many printers now come Commodore-ready; that is, the package includes a cable that plugs directly into the computer or the disk drive and runs to the printer. If the printer you want doesn't come Commodore-ready, find out what kind of interface you'll need, and how easy it is to find. Many printers have gathered dust in people's homes while their owners frantically called friends, computer stores, and mail-order houses to find the right interface. It's best to get this kind of information before you buy.

Paper-handling. If you're planning to use your printer just to print out program listings on continuous-feed paper, either tractor or friction feed works well, depending on the individual unit. Tractor-feed is normally more reliable for this kind of printing, but a badly-constructed tractor can create a lot

of irritation if you have to keep stopping in the middle of printing jobs to re-adjust the paper. A friction-feed printer might suffice for this purpose, as long as it's well-constructed and you have the paper lined up straight.

But if you're planning to print correspondence and mailing labels as well as program listings, you'll need to look for a printer that easily accommodates switching back and forth. Some tractor feed mechanisms adjust to handle many different sizes of printer paper or labels, and snap off easily for printing on individual sheets.

Where the paper goes in to and comes out of the printer is important, too, especially if the space you have dedicated for computer use at home is limited. This is something people often forget to think about, and consequently spend unnecessary time moving things out of the way when it's time to print. Moving the paper in and out of the printer is handled in a variety of ways by different manufacturers. Some feed in from the front and some from the rear. On rear-feed printers, still the most common, it's very handy to have a sheet of plastic or metal that separates the two streams of paper. This is standard on some printers; if it's not, you can purchase an inexpensive wire separator that will do the job.

Paper-handling may seem like a fairly insignificant thing to consider when you're looking for a printer, but if you buy one that does the job badly, you'll be amazed at the time and frustration it can create.

Switch-selectable modes. Most printers these days are equipped to print a variety of different type styles. If you anticipate having to change type styles often, you'll want a printer that lets you do that easily, without having to get at the machine's internal DIP switches. Some printers require short programming commands to change type styles, while others have buttons or switches on the outside that let you do that quickly.

Ribbon-changing. Not too many years ago, changing a printer ribbon was much like changing the ribbon on an old manual typewriter: messy and time-consuming. Most newer printers use cartridges or cassettes, plastic-encased ribbons that snap in and out easily.

Here's what one innovative printer manufacturer has done to facilitate ease of use. C. Itoh's PROWRITER jr has "legs" that make it simpler to feed paper in and out of the printer.

It's a good idea to find out what the average life of a ribbon is for a particular printer, how expensive new ones are, and how easy they are to purchase. Your printer could sit idle for a few weeks if ribbons run out quickly and are hard to find.

Print Quality

How good does your printed copy need to look? After all, you're probably not buying a printer *just* to print things out, but also to make your documents look a certain way. A polished typewriter-style look is desirable if you're going to be using your printer for college papers or business correspondence and reports, but is unnecessary if you'll just be using it for casual correspondence or other personal needs. In this price range, a daisywheel printer still offers the sharpest type, but many dot-matrix printers have what's called near-letter quality (NLQ) mode, which produces near-typewriter-quality.

Dot-matrix printers form characters and graphics through a *printhead*, a configuration of tiny pins that strikes the paper through an inked ribbon. In this price range, a nine-pin configuration is the most common. Printers using a 24-pin printhead, which allows crisper type and better graphics capabilities, have only recently broken the $1000 price barrier. You can expect to see these printers become less expensive over the next year or so.

Software/Hardware Compatibility

The question of hardware compatibility is not so much whether or not the printer will work with your computer, but how difficult it will be to interface them. A dealer may tell you whether or not a particular model is Commodore-compatible, but may not be clear on exactly what interface you need. If you buy a unit that is not Commodore-ready, be sure to find out which third-party interfaces will work.

Also, if you've already invested a lot of money in software, you'll want to make sure that your packages with printout capabilities are compatible with the printer you buy. Probably the two most common applications that you'd want a printer for are word processing and personal publishing (packages like Brøderbund's *Print Shop* and Springboard Software's *The Newsroom*). Many such software packages are worthless without a printer. Most come with a listing of printers that are compatible, either in the documentation or within the program itself.

Graphics/Color Capability

The printhead, which prohibits dot-matrix printers from printing letter quality type, also makes it the best

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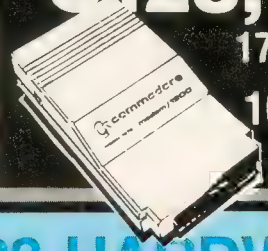

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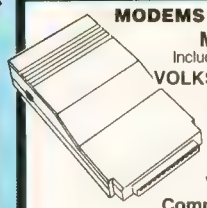

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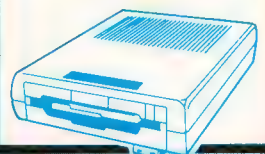

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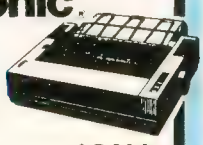

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choice for a person who wants to print graphics. If you plan to program a lot of graphics displays, the *dot-addressable* graphics capabilities of these printers will probably serve your purposes best. Thermal transfer printers also offer good graphics capabilities.

If you use applications that require color, your choices are still fairly limited. Some dot-matrix and thermal transfer printers support color. A word of warning here: Try to get some solid information on the average life of each color ribbon. You could find yourself spending almost as much on ribbons in a year as you spent for the printer.

Stability Of Manufacturer

If you anticipate needing long-term support for your printer, this is an extremely important consideration, and one that is not just a yes/no question. Try to find out how long the company has been around and, if possible, how healthy it is. A big electronics company that has a printer line is not necessarily better than a small company that specializes in computer peripherals; one particular product line can be discontinued as easily as a small company can fold. Ask around and see what your friends and local computer dealer know.

A sound manufacturer should offer good technical support for consumer problems. An 800 number for questions is ideal, but not always possible. There should be some way for printer owners to contact the manufacturer when major problems arise.

Though these are usually the most important things to consider when you're shopping for a printer, there are many other factors. Depending on your needs, some of these may be more important than those listed above.

Does the printer support the types of fonts you'll be using most often? Your word processor probably lets you use different types of fonts: superscript, subscript, boldface, expanded, and compressed. Not all printers are capable of printing such fonts. If you anticipate using them often, make sure the printer you buy will allow that.

How fast can the printer print? Your needs will dictate whether or not you need a fast printer. Speeds often vary, depending on what mode it's in. Correspondence or NLQ mode is quite often up to ten times slower than draft mode.

How noisy is it? Unless your printer is set up in a soundproof booth, this may be of some importance to you. If you plan to use the printer early in the morning or late at night, consider your surroundings and who might be disturbed by the noise. Your dealer should let you run a test to check the noise level.

How thorough is the documentation? It's not always possible for you to look at this before buying, especially if you buy a printer through the mail, but, when possible, take a look at it. A truly user-friendly printer will not require a lot of documentation. If set-up and operation of the unit are easy enough, the bulk of the documentation will focus on programming commands.

How many columns across can be printed? Very few printers are limited to 40-column printouts any more, though some are still sold. If you can't imagine yourself ever using your printer for anything but program listings, one of these will suffice. Most printers offer at least 80 columns, and some go up to 136. For most word-processing and graphics applications, 80 columns is fine. But many business applications, like spreadsheets, require 136 columns.

How long is the warranty? This is crucial, especially if you buy a fairly new model, or a product from a relatively young company. One year is a fairly standard warranty time these days.

If you buy a daisywheel printer, how easy is it to find new printwheels? Many daisywheel printers use wheels that are the same as those used on typewriters. If this is true, you can probably get replacements easily from a local office supply store. If not, find out where you can get them.

Does the printer support different character sets? If you plan to use nonstandard characters, like those used in foreign languages or scientific notations, you'll need a printer that supports them. ■

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A Buyer's Guide To Printers

One of the most important purchases for any computer owner is the type of printer that's to be connected to his or her system. But for most of us, the wide array of printer models, capabilities, and options that present themselves is often confusing and occasionally intimidating. To help you get the most for your money, here's a rundown of Commodore-compatible printers available for under $500.

If you already know how you'll be using a printer and what features you'll need before you start shopping, the hard part is over. There are many good printers available for a variety of applications, and prices continue to drop as manufacturers expand their hardware lines.

We've gathered information on printers in the under-$500 price range, and listed some of the most important features in the following chart. Any omissions are not an editorial judgment of quality.

Here's a brief explanation of the major categories on the chart:

Compatibility. Commodore computers use a unique serial data communications format that is not compatible with either standard parallel or standard serial printer formats. In the past, the only way to avoid compatibility problems was to buy a Commodore printer. Over the last couple of years, manufacturers have developed printer interfaces that plug directly into a Commodore computer. If you're interested in one of these Commodore-ready units, be sure to find out if there is an additional charge for the cable. Even if the printer does not include a Commodore interface, you can buy third-party cables that work with most parallel printers.

Print Technology. This refers to how characters and graphics are actually transferred from printer to paper. There are three types in this price range: impact, thermal, and ink-jet.

Impact printers form characters by striking the paper through an inked ribbon, either with a *daisy-wheel* (a small wheel whose spokes have letters and numbers on their tips), or with a printhead containing a column of tiny wires or pins that form characters and graphics *(dot-matrix). Thermal* printers use either a column of hot pads that change the color of heat-sensitive paper, or a column of tiny spark plugs that evaporate a special aluminum coating onto the paper, exposing an underlying dark surface. So thermal printers require special paper, which often costs more than regular paper and has a shorter life. *Thermal transfer* printers work with any kind of paper because they use ribbons; heat from the printhead melts a waxlike ink onto the paper. *Ink-jet* printers spray ink onto the paper through tiny holes.

Speed. How fast does the printer operate? This can vary if the printer offers different modes. *Draft mode* is usually the fastest, but produces rougher, fainter type. *Near letter quality (NLQ)* or *correspondence mode* takes longer to print, but looks more polished. Some printer speeds vary depending on the type of *font* (i.e., pica or elite) used.

Pitch. How many characters fit on a line, measured in characters per inch (cpi) or characters per line (cpl). The pitch range for a printer often varies greatly, especially if it is capable of printing several types of fonts.

Buffer. A buffer is an area of memory in a printer that can store a fixed amount of text while the printer is working, freeing up the computer for other tasks. Most printers in the under-$500 price range still have rather small buffers, so if you'll be doing many long printing jobs, you may want to consider buying an add-on buffer.

Feed Type. *Friction-feed* printers grip the paper and move it around the platen much like a typewriter does, while *tractor-feed* printers grab the holes at the edge of continuous-feed paper with the tiny teeth at either edge of the platen. Many printer manufacturers sell add-on tractors that you can purchase if your original unit didn't have one.

Suggested Retail Price. This is the price set by the manufacturer; you may well be able to find it at a lower price. It's advisable to shop around.

A full explanation of the graphics capabilities of each printer takes more space than we have available. If you plan to use your printer extensively for printing graphics, make sure it's capable of doing what you need before you buy.

(For more details on printers, see "Five Steps to the Right Printer," elsewhere in this issue.)

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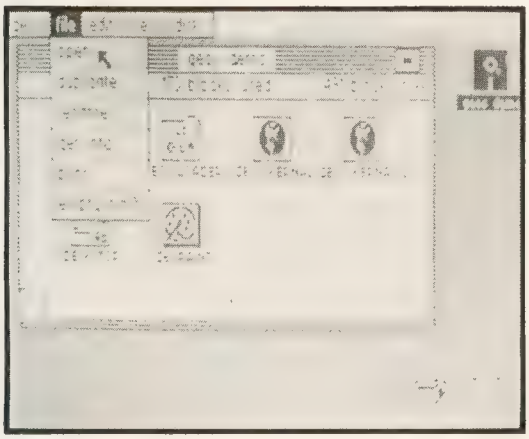

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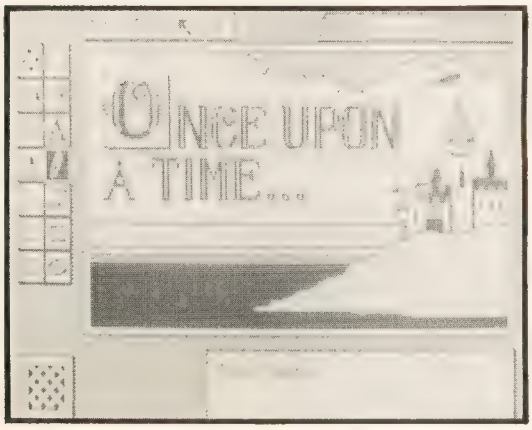

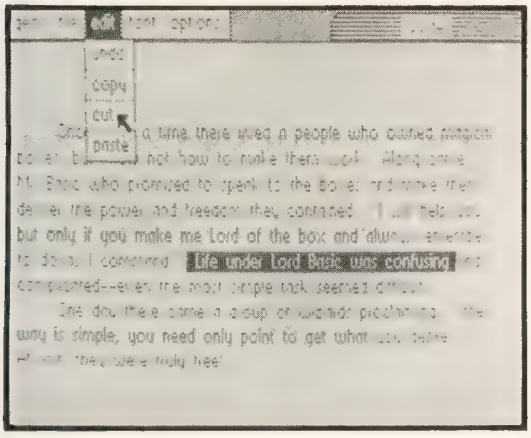

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A-50	Canon USA, Inc.	Parallel std; serial opt	Dot matrix	34–180 cps	N/A	2K	Friction and tractor; forms guide opt	1 year	499	Epson FX compatible
Alphacom Aero	Alphacom, Inc.	Parallel or serial std	Dot matrix	130 cpa	40–132 cpl	2K	Friction and pin	6 months	299	Dot addressable and fully programmable graphics
Alphapro 101	Alphacom, Inc.	Parallel or serial std	Daisy wheel	20 cps	10–15 cpi	93 char	Friction	6 months	399.95	
Aprotek Daisy 1120	Aprotek	Parallel std; serial opt	Daisy wheel	20 cps	10–15 cpi and proportional	2K	Friction std; tractor and cut sheet feeder optional	1 year	374	Two week trial available
Blue Chip 120/NLQ	Blue Chip Electronics	Parallel std	Dot matrix	120 cps	5–17 cpi	N/A	Tractor	6 months	249	
Companion 10I	Xerox/Diablo	Parallel std	Dot matrix	80 cps	10–15 cpi	1K	Friction and tractor	90 days	399	Bit map graphics
CP-80 Type 1	Everett/Charles Marketing Service, Inc.	Parallel std; serial opt	Dot matrix	80 cps	N/A	No	Friction and tractor	90 days	$250	Bit image graphics; Superscript
Dataproducts 8010	Dataproducts Corp.	Parallel and serial std	Dot matrix	30–180 cps	10–17 cpi	2K (8K opt)	Friction and tractor	1 year	$499	Block or dot addressable graphics
Dataproducts 8012	Dataproducts Corp.	Parallel std	Dot matrix	20–180 cps	10–17 cpi	2K (8K opt)	Friction and tractor	1 year	499	Block or dot addressable graphics
DMP 105	Tandy Corp.	Parallel and serial std	Dot matrix	80 cps	10–17 cpi and proportional	N/A	Friction and tractor	90 days	199.95	Bit image graphics
DMP 120EX	Crosstech, Inc.	Parallel std; serial opt	Dot matrix	120 cps	5–17 cpi	1 line	Friction and tractor	90 days	299	Dot addressable graphics; five graphics modes
DMP 130	Tandy Corp.	Parallel and serial std	Dot matrix	100 cps	80–132 cpl	N/A	Friction and tractor	90 days	349.50	Bit image graphics
DX-10	Epson America, Inc.	Parallel std	Daisy wheel	10 cps	10–12 cpi	No	Friction tractor and cut sheet feeder opt	1 year	299	
DX-20	Epson America, Inc.	Diablo all purpose interface standard	Daisy wheel	20 cps	N/A	1K (7K opt)	Friction std; tractor and cut sheet feeder opt	1 year	459	110 column
DX 1500	Axiom Corp.	Parallel standard	Daisy wheel	14 cps	10–12 cpi and proportional	2K	Friction std; tractor and auto cut sheet feeder opt	1 year	349	
DX 2000	Axiom Corp.	Parallel standard	Daisy wheel	20 cps	10–15 cpi and proportional	2K	Friction; tractor opt	1 year	449	
DX2100	Fujitsu America, Inc.	Parallel std; serial opt	Dot matrix	220 cps	10–17 cpi	2K (18K opt)	Friction and tractor cut sheet feeder opt	1 year	495 (Color 645)	Dot addressable graphics
DX 2500	Axiom Corp.	Parallel std; serial opt	Daisy wheel	20 cps	10–15 cpi and proportional	2K	Friction; tractor opt	1 year	499	
D12/10	Blue Chip Electronics	Commodore serial std	Daisy wheel	12 cps	N/A	2K	Friction; tractor opt	6 months	249	Comes with Fleetwriter III wordprocessor
D20/10	Blue Chip Electronics	Parallel and Commodore serial std	Daisy wheel	20 cps	N/A	2K	Friction; tractor opt	6 months	279	Comes with Fleetwriter III wordprocessor
D-100	Smith Corona	Parallel std; serial opt	Dot matrix	120 cps	5–17 cpi	256 bytes	Friction and tractor	1 year	295	
D-200	Smith Corona	Parallel and serial std	Dot matrix	25–160 cps	5–17 cpi and proportional	2K	Friction and tractor	1 year	445	Bit image graphics
Elite 5	Aprotek	Parallel and Commodore serial std	Daisy wheel	10–12 cps	10 cpi	No	Friction; tractor opt	1 year	199.95	Two week trial available;- Commodore version $229.95
EXP 500	Silver-Reed, Inc.	Parallel or serial std	Daisy wheel	14 cps	10–15 cpi	No	Friction; tractor and cut sheet feeder optional	90 days	449	
Facit 4509	Facit, Inc.	Parallel std	Dot matrix	70–120 cps	10–17 cpi and proportional	No	Tractor	90 days	425	IBM compatible graphics
Facit 4510	Facit, Inc.	Parallel and serial std	Dot matrix	70–120 cps	10–17 cpi and proportional	2K	Friction and tractor	90 days	495	Block and pin addressable graphics
Fastext-80	Smith corona	Parallel std; serial opt	Dot matrix	80 cps	5–17 cpi	32 bytes	Friction tractor opt	1 year	259	
FORTIS DX-25	Dynax	Parallel and serial std	Daisy wheel	25 cps	10–15 cpi	7K	Friction and tractor; cut sheet feeder opt	90 days	149.95	
FX-85	Epson America, Inc.	Parallel std	Dot matrix	32–160 cpo	N/A	8K	Friction and tractor; cut sheet feeder opt	1 year	499	
GE 8100	General Electric	Parallel std; Atari, Commodore and IBM PCjr interfaces available	Thermal transfer (non-impact dot matrix)	25–50 cps	192 cpl	2K	Friction	2 years	259.95	Block graphics; special graphics characters
GLP	Centronics	Parallel std; serial opt	Dot matrix	12–50 cps	5–17 cpi	No	Friction; tractor and pin opt	1 year	299	Portable: 6.6 pounds

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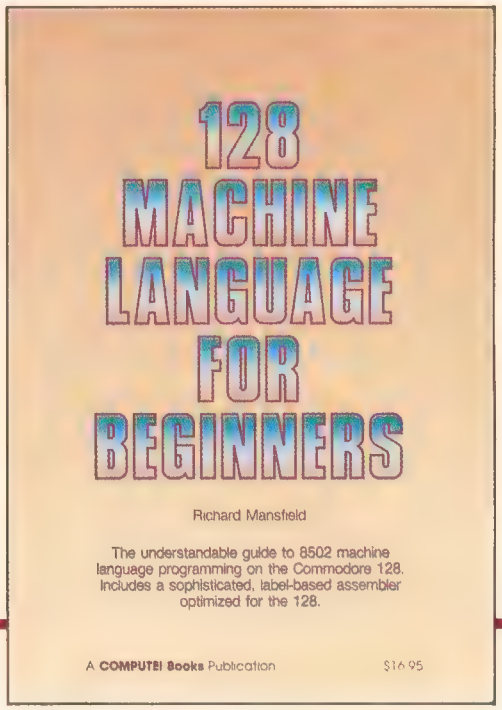

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Model Name	Manufacturer/ Distributor	Compatibility	Print Technology	Speed	Pitch	Buffer	Feed Type	Warranty	Suggested Retail Price	Comments
Homewriter 10	Epson America, Inc.	PIC (Printer Interface Cartridge-PIC's are available for most home computers)	Dot matrix	16–100 cps	N/A	1K	Friction; tractor and cut sheet opt	1 year	249	Selectype available
HR-10	Brother International Corp.	Parallel and serial std	Daisy wheel	12 cps	10–15 cpi and proportional	2K	Friction and tractor	90 days	349	
HS-80	Epson America, Inc.	Parallel std	Ink Jet	32–160 cps	N/A	N/A	Friction; auto cut sheet feeder opt	1 year	449	
IMP-24	Weigh-Tronix, Inc.	Parallel or serial std	Dot matrix	16.8 cps	N/A	1 line	Friction	90 days	135 (24 cpl) 150 (32 or 40 cpl)	Dot addressable graphics
Juki 5510	Juki Office Machines Corp.	Parallel std	Dot matrix	20–180 cps	10–17 cpi	3K (15K opt)	Friction and tractor	1 year	499	
Juki 6000	Juki Office Machines Corp.	Parallel std; serial opt	Daisy wheel	10 cps	10–15 cpi	2K serial	Friction	1 year	295	
JX-80	Epson America, Inc.	Parallel std	Dot matrix	160 cps	10–12 cpi	N/A	Friction and tractor	1 year	399	
KX-P1080	Panasonic Co.	Parallel std; serial opt	Dot matrix	20–100 cps	10–17 cpi	1K	Friction and tractor	2 years	319	Bit image graphics; can emulate Image Writer; Epson RX-80 compatible; color ribbons available
KX-P1091	Panasonic Co.	Parallel std; serial opt	Dot matrix	29–120 cps	10–17 cpi	1K (4K opt)	Friction and tractor	2 years	399	Same as above
KX-P1092	Panasonic Co.	Parallel std; serial opt	Dot matrix	22–180 cps	10–12 cpi and proportional	7K	Friction and push tractor	2 years	499	Bit image graphics; Epson FX-80 compatible; color ribbons available
KX-P3131	Panasonic Co.	Parallel std; serial opt	Daisy wheel	17 cps	N/A	6K (32K optional)	Friction; tractor and auto cut sheet feeder opt	2 years	419	Diablo 630 code compatible; color ribbons available
Legend 808	CAL-ABCO	Parallel std	Dot matrix	50–100 cps	5–17 cpi	1 line	Friction and tractor	90 days	199	Bit image graphics
Legend 1080	CAL-ABCO	Parallel std; serial opt	Dot matrix	70–140 cps	5–17 cpi	1 line (4K opt)	Friction and tractor	90 days	339	
Legend 1385	CAL-ABCO	Parallel std; serial opt	Dot matrix	160 cps	5–17 cpi	2K (4K opt)	Friction and tractor	90 days	449	
Letter Master	Royal Consumer Business Products	Parallel std; serial opt	Daisy wheel	10 cps	10–12 cpi	84 characters	Friction	90 days labor; 1 year parts	299.95	
LQ18	Crosstech, Inc.	Parallel std; serial opt	Daisy wheel	18 cps	10–15 cpi	256 bytes	Friction; tractor and sheet feeder optional	90 days	399	
LX-80	Epson America, Inc.	Parallel std	Dot matrix	16–100 cps	N/A	1K (32K opt)	Friction; tractor and cut sheet feeder opt	1 year	299	Over 160 typestyles available through Selectype
LX-90	Epson America, Inc.	PIC	Dot matrix	16–100 cps	N/A	1K	Friction and tractor	1 year	329	
M-20P	TAB Products	Parallel std	Dot matrix	120 cps	10–15 cpi	1K	Friction and pin tractor opt	90 days	299	Dot addressable graphics
M-21P	TAB Products	Serial std	Dot matrix	120 cps	10–15 cpi	1K	Friction and pin tractor opt	90 days	378	Dot addressable graphics
M-22P	TAB Products	Parallel std	Dot matrix	160 cps	10–15 cpi	1K	Friction and pin; tractor and cut sheet feeder opt	90 days	499	Dot addressable graphics
M 120/10	Blue Chip Electronics	Parallel std; serial opt	Dot matrix	120 cps	5–17 cpi	3 lines (4K opt)	Friction and tractor	6 months	279	Dot addressable graphics
M 150/15	Blue Chip Electronics	Parallel std; serial opt	Dot matrix	130 cps	5–17 cpi	2K	Friction and tractor	6 months	399	Dot addressable graphics
M-1509	Brother International Corp.	Parallel and serial std	Dot matrix	45–180 cps	10 cpi	3K	Friction and tractor; cut sheet feeder opt	1 year	499	Seven bit image graphics
Microline 182	Okidata	Parallel and serial std	Dot matrix	120 cps	5–17 cpi	1 line	Friction and pin	1 year	299	Block and bit image graphics
Microline 183	Okidata	Parallel std	Dot matrix	120 cps	5–17 cpi	1 line	Friction and tractor	1 year	499	Block and bit image graphics
Microline 192	Okidata	Parallel and serial std	Dot matrix	33–160 cps	5–17 cpi	8K	Friction and pin	1 year	499	Block and bit image graphics
MPS 1000	Commodore Business Machines	Parallel and serial std	Dot matrix	20–100 cps	12–17 cpi	1K	Friction and tractor	90 days	299.95	
MSP-10	Citizen America Corp.	Parallel std; serial opt	Dot matrix	40–160 cps	10–12 cpi	1K	Friction and tractor; cut sheet feeder opt	18 months	399	Emulates IBM graphics
MSP-20	Citizen America Corp.	Parallel std; serial opt	Dot matrix	50–100 cps	10–12 cpi	8K	Friction and tractor; cut sheet feeder opt	18 months	499	Can create own graphics
MT85	Mannesmann Tally	Parallel, serial or Apple std	Dot matrix	45–180 cps	10–17 cpi	3K	Friction and tractor	1 year	499	Dot addressable graphics
Okidata 120	Okidata	Commodore serial	Dot matrix	120 cps	5–17 cpi	256 bytes	Friction and pin	1 year	298	All points addressable graphics; Commodore Special Graphics
Okimate 10	Okidata	Commodore and Atari	Dot matrix	60 cps	5–17 cpi	296 bytes	Friction and pin	1 year	208	All points addressable graphics; Commodore Special Graphics
Okimate 20	Okidata	IBM, Apple and Amiga	Dot matrix	40–80 cps	5–17 cpi	8K	Friction and tractor	90 days	268	High resolution, all points addressable, bit image graphics

Model Name	Manufacturer/ Distributor	Compatibility	Print Technology	Speed	Pitch	Buffer	Feed Type	Warranty	Suggested Retail Price	Comments
PC-PR105A	NEC Home Electronics, Inc.	Parallel std	Dot matrix	46–92 cps	80 cpl	4K	Friction and tractor	90 days labor; 1 year parts	399	
Powertype	Star Micronics	Parallel std; serial opt	Daisy wheel	18 cps	10–15 cpi and proportional	1 line	Friction; tractor opt	180 days	499	
Printelex	Computer Peripherals	Parallel and serial std	Dot matrix	160 cps	12 cpi	1 line	Friction	90 days	174	40 column, comes with power pack; 1 1/2 pounds
Prowriter Jr.	C. Itoh	Parallel std; serial opt	Dot matrix	20–105 cps	10–17 cpi	1 line	Friction and tractor	1 year	299	
Scribe	Apple Computer	Serial std	Dot matrix	50–80 cps	10–17 cpi	N/A	Tractor	90 days	249	
SD-10	Star Micronics	Parallel std; serial opt	Dot matrix	160 cps	N/A	2K	Friction and tractor	1 year	449	Ultra-high resolution bit image graphics
SG-10	Star Micronics	Parallel std; serial opt	Dot matrix	30–120 cps	N/A	2K	Friction and tractor	1 year	299	High resolution bit image graphics; (Commodore ready version: $339)
SG-15	Star Micronics	Parallel std; serial opt	Dot matrix	30–120 cps	N/A	16K	Friction and tractor	1 year	499	High resolution bit image graphics
Silver-Reed 400	Silver-Reed, Inc.	Parallel or serial std	Daisy wheel	10 cps	10–15 cpi	No	Friction; tractor opt	90 days	349	
SP-1000	Hattori Seiko	Parallel or serial std	Dot matrix	100 cps	10–17 cpi and proportional	Varies with model	Friction and tractor	2 years	299	Commodore/VIC version: $270
SP-1000	Aprotek	Parallel or direct connect; IBM standard	Dot matrix	20–70 cps	N/A	1.5K	Friction and tractor	2 years	259.95	Dot addressable graphics; Commodore graphics built-in on Commodore version
SP-1200 PLUS	Sakata	Parallel std	Dot matrix	120 cps	N/A	N/A	Friction and pin	90 days	399	
SP-1500	Sakata	Parallel std	Dot matrix	180 cps	N/A	N/A	N/A	90 days	489	
STX-80	Star Micronics	Parallel std	Thermal transfer dot matrix	60 cps	5–11 cpi	1 line	Friction	1 year	199	Dot addressable, bit image graphics
Thinkjet (HP2225)	Hewlett-Packard	Parallel, HP-1B, HP-1L and serial available	Thermal ink jet	150 cps	40–142 cpl	1K	Friction and pin	1 year	495	Best results using special paper; portable
Thin Print 80P/80S	Axonix Corp.	Parallel or serial std	Thermal transfer dot matrix	40 cps	10–17 cpi	2K	Friction	90 days	339	High resolution graphics; portable (battery powered), AC adaptor included;
Thin Write 80W	Axonix Corp.	Parallel and serial std; HP-1L opt	Dot matrix	24–100 cps	5–17 cpi	2K	Friction; tractor opt	90 days	449	Battery powered
TP 10	Tandy Corp.	Parallel and serial std	Dot matrix	32 cps	32 cpl	N/A	Friction	90 days	99	Uses special 4 1/8" thermal paper
TRP 100	Tandy Corp.	Parallel and serial std	Dot matrix	50 cps	N/A	N/A	Friction and sheet feed	90 days	299.95	Uses thermal paper
Westrex One	Litton Westrex	Parallel or serial std	Dot matrix	42–140 cps	10–15 cpi	2K	Friction and pin	1 year	199	

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Paperback Writer 128/64

Paperback Writer, a disk-based word processor by Digital Solutions available in versions for the Commodore 128 or 64, is reasonably priced, full-featured, versatile, and user-friendly. Billed as "serious software that's simple to use," its friendliness is attested to by its reference *guide*—not "manual." The profuse onscreen help is deemed sufficient (in most cases it is), and explains the absence of any tutorial material. However, I'd prefer to describe *Paperback Writer* as "*relatively* easy to use," since processing power makes for complexity, and *Paperback Writer* has *plenty* of power. In my view, *no* powerful software is simple to use, not at this point in hardware/software development. The point is that *Paperback Writer* is well thought out from a user's point of view and HELP (as well as basic entry and exit operations) is always available onscreen. Even a keyboard overlay is not really needed.

In spite of several significant differences between the 128 and 64 versions of *Paperback Writer*, most features are identical (they use the same reference guide); I'll mention augmented 128 capability only as appropriate.

Perhaps the most noteworthy feature of *Paperback Writer* is the "what you see is what you get" orientation. No commands are embedded in text; they're either specified, by paragraph, in a separate formatting list, or directly implemented on screen. In any case, the screen is formatted as it will appear on the printed page. Underlined text is indeed underlined, boldface type is bold (brighter), italics are slanted. There is also super/subscript capability. While the 128 version screen-formats super and subscripts, the 64 version only prints these characters in a contrasting color. Though coloration of various screen elements can be readily changed by the user, the color-coding of 64 super/subscripts can be confusing, even on a color monitor. For extensive use of super and subscripts, I recommend the *Paperback Writer 128*.

The features of *Paperback Writer* are extensive; they seriously challenge word processors with much higher price tags. Included are automatic word wrap, find/search/replace, mail merge, 40/80 column option, side-scrolling, block definition/moving/copying/deleting, external file printing, file linking, global formatting, and a program/sequential file storage/change option (for communications and compatibility purposes). Also there are ten foreign or redefinable characters, six "extra" characters (including underline and curved brackets), as well as list sorting, aligned numerical text (such as dollar amounts), and addition and subtraction of number "blocks." All disk commands are available within *Paperback Writer*, and text files are compatible with a number of leading word processors. A multitude of formatting options are incorporated; they are designed to take full advantage of various dot-matrix printer capabilities. The programs contain 15 customized popular printer files (including standard ASCII and Commodore), and there are provisions for defining and saving additional files.

A Spelling Check option is available in all versions, but there is no dictionary included with the program itself. The dictionary program, *Paperback Dictionary 128/64*—a single disk that works with both the 128 and 64 versions—is now available separately at $14.95. It contains 32,000 words on disk with room to add up to 8,000 more. Prospective users should know that the 128 spelling checker can be loaded in 40-column mode only. To check spelling in either version, the document must first be saved, then the program and text reloaded.

Here are the figures on available text memory: 128 version, nearly 64K (80 columns) and close to 15K (40 columns); 64 version, more than 15K (40 columns), and almost 7K (80 columns). Note the highly restricted text memory in the 64 versions. (Compared with *Paperback Writer 64* in 40 columns, slightly fewer bytes are available on the 128 in 64 mode—about 800 less. This total is identical to the 128 in 40-column mode, since the programs are the same.) The severe memory limitation in the 64's 80-column mode is due to the fact that the text portion of the screen is drawn totally in high-resolution graphics. In graphics quality (clarity and readability), the 64's 80-column mode is no match for the 128's. It is also considerably slower than the other modes. Thus for users wanting 80-column display, I recommend the 128 version. (Many 128 owners, I think, will continue, however, to prefer the 40-column display; it's unfortunate that more memory is not available in this mode.)

The major enhancement in *Paperback Writer 128*—and it's an important one, but limited to 80-column mode only—is the dual text file capability. The nearly 64K text memory can optionally be split into two 32K (actually 28K-plus) blocks. The user may then freely alternate between blocks (which are in memory concurrently), and *transfer* text at will. Blocks may be separately saved, and "64K" and "32K" modes may be toggled at will. Formatting is unique to each file block.

The only thing I found annoying in these programs is an awkward "cursor right," the problem being that the cursor does not wrap around from the right margin to the left. When using the cursor right key to advance the text pointer, the cursor continues to scroll horizontally (as the text moves left) instead of wrapping around to the next line. (Cursor left, for "backing up," works as you'd expect.) This applies any time you use cursor right within text—such as when defining text ranges. To get to the text below, you must use cursor down (or more logically, the "word advance" function key option).

Both 128 and 64 versions of *Paperback Writer* represent excellent value. I recommend the 128 package over the 64 especially because of the substantially increased text memory. (To get the extra memory, you have to go to 80 columns). If you want 80-column display, choose the 128 version as well; it's considerably more readable. The 128 version is preferable if you're considering using a single *Paperback Writer* on *both* machines; its 40-column option works identically on the 64. (Of course, the 64 package also works on the 128—in 64-mode.) If you plan to use super and

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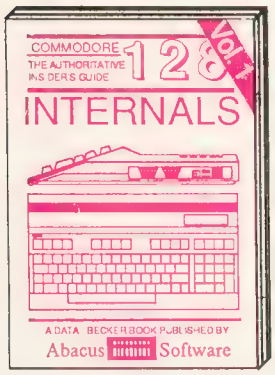

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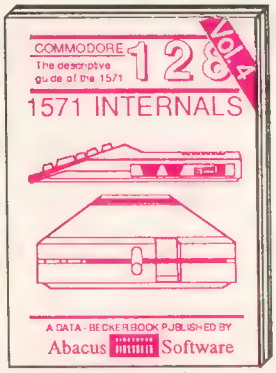

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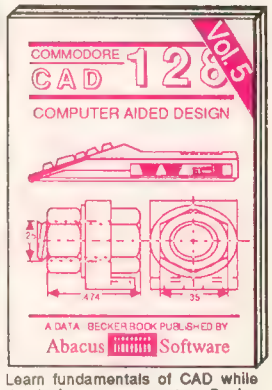

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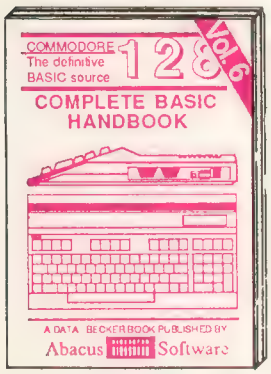

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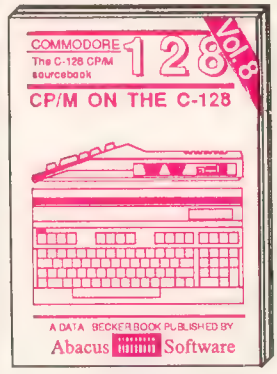

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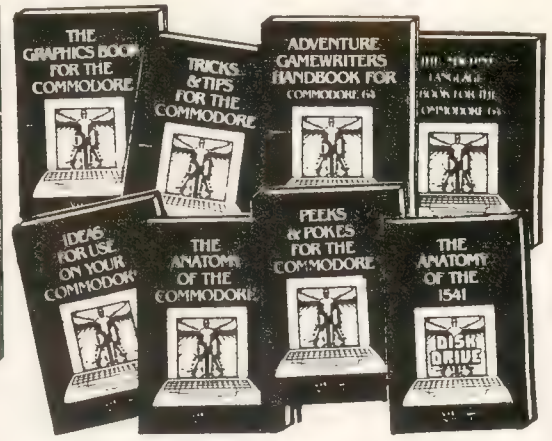
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subscripts extensively, select *Paperback Writer 128;* it displays these characters accurately instead of resorting to color-coding. For either version, I recommend a monochrome monitor; it's considerably easier on the eyes (compared to the color of the Commodore 1702 monitor). To use the 128 80-column version with a monochrome monitor, you'll need an RGB to RCA-phono cable adapter.

Both *Paperback Writer* versions are available in French. And both are integrated with Digital Solutions' *Paperback Planner 64* and *128*, a spreadsheet, and *Paperback Filer 64* and *128*, a database manager, comparably priced. *Paperback Writer 64* owners can upgrade to *Paperback Writer 128* for $15 plus $3 shipping. It sounds to me like a good deal all around.

—Art Hunkins

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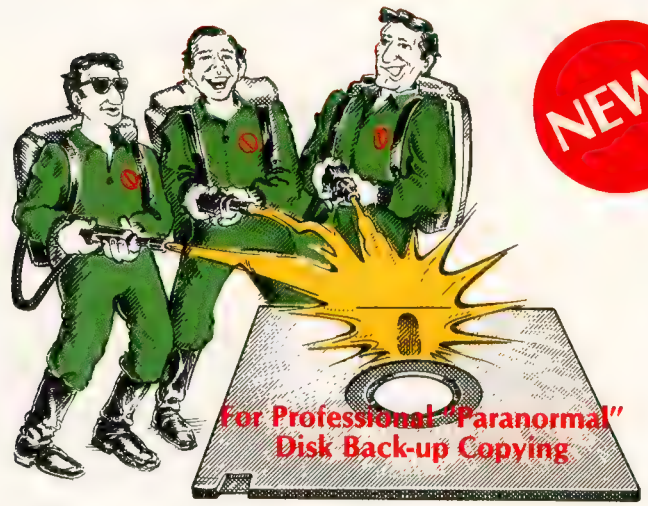

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Elite

Elite has won several computer game awards in England and it's easy to see why. This is a masterpiece, one of the best games ever published for the 64. Even expert machine language programmers may find themselves wondering how the authors put it all together.

On one level, it's a 3-D spaceflight simulator. Three displays provide information on your exact location at any time. The window at the top shows nearby objects—ships, asteroids, space stations, and the like—against a backdrop of stars. Press the function keys to look out the back, or to the left or right. This is the display to watch when you go into combat against a pirate ship.

At the bottom center of the screen is the long-range radar, which tells you where other objects are in relation to the direction you're traveling. Asteroids show up in red, other ships are yellow. To move towards a ship, you must first line it up on the radar. When you see a small dot in the center of the visual screen, you can accelerate towards the dot, which gets larger and more recognizable as you get closer. The 3-D graphics are nicely done; each ship is drawn as an outline of a geometric shape which is rapidly updated. If you watch closely, you can anticipate the other captain's moves by which way the other ship is turning.

Finally, there's a small circle which tells you the relative location of the closest planet. When you come within range of the planet's space station, this indicator changes to a space station locator.

But only part of the game is pure action, moving around space shooting at the bad guys. There's another aspect to *Elite*, one that makes it more than just a shoot-'em-up. You begin the game with a small ship equipped with an ineffective laser and only 100 credits. There are 17 commodities you can buy and sell, some of which may be unavailable at certain planets. Food, textiles, and furs are generally plentiful and low-priced at agricultural systems, so if you travel to an industrial planet, you can usually make a profit on these items. There, you might buy computers and machinery to sell to an agricultural society. As you make money, you can begin to afford equipment like better lasers.

The action of the game is well-balanced by the strategic aspects. When you're engaged in a space battle, you have to move fast. But once you've docked at a planet's space station, you have to think carefully about your long-term strategy—where you're going

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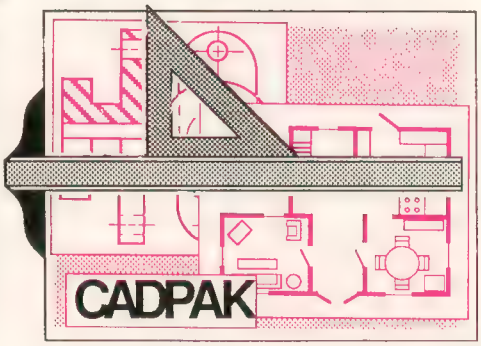

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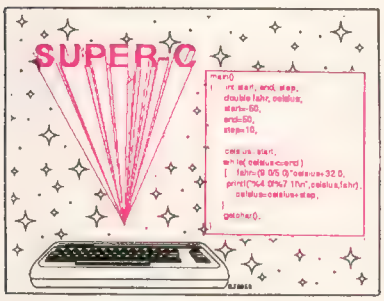

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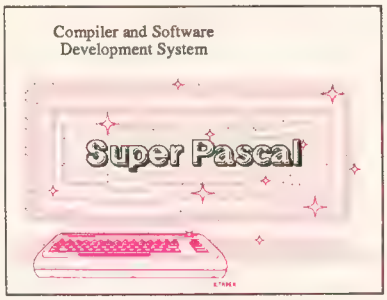

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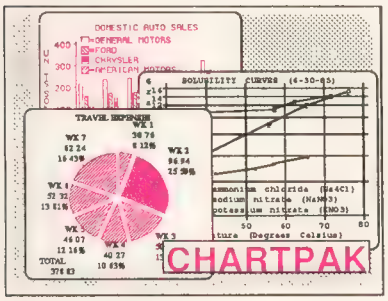

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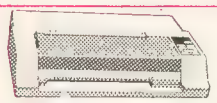

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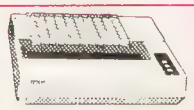

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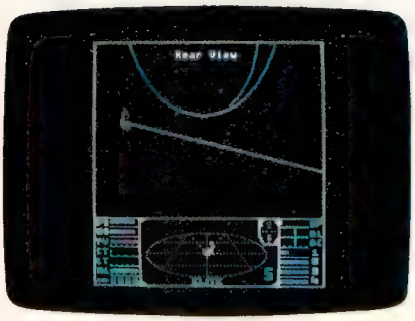

next and what kind of cargo will bring the best price.

You might say the ultimate goal of the game is a trip to England. You mail in your best score (along with a verification code generated by the program) and the best player is awarded a week in London. The contest ends March 31, 1986.

You begin with a combat rating of Harmless. As you move from planet to planet, you fight against pirate ships (who are trying to blow up your ship in order to collect the flotsam). You gradually advance through the ranks: Mostly Harmless, Poor, Average, Above Average, Competent, Dangerous, Deadly, and (finally) Elite. After 80 planets and countless unavoidable battles, I've managed to earn a rating of Above Average and enough money for a fully-outfitted ship.

There are 250 planets in each of the eight galaxies, a total of about 2000 systems you can visit. You're not likely to run out of new planets to see. Hyperspace flights are limited to seven light years, though, so there are usually only a half-dozen planets within range. If you keep track of the prices at various systems, you can figure out which items you can buy for a low price, and make money more quickly.

Paradoxically, the best strategy for earning the exalted Elite status is to run away from dogfights at the beginning of the game. Fill up your cargo hold, leave the space station, jump through hyperspace, and move as fast as you can to the nearest planet (and save your game position at every planet). Sell what you can to make a profit, buy some more, and move to a new planet. At game's start, your ship is too weak to last through more than a battle or two. And avoid planets that are listed as anarchies or feudal worlds until you've added better offensive and defensive weaponry. (Anarchies are tough even when you've got the best equipment.)

When you make some money, buy a cargo bay extension, which increases your available space from 20 one-ton cannisters to 35. The more you haul, the more money you can make. Soon you'll want to replace the relatively weak pulse laser with a beam laser to make the battles a little easier to win. By all means, buy a military laser (a whopping 5000 credits) when you can afford one. You may also want a rear-mounted laser so you can fire at an opponent as you run away. Even with a well-equipped ship, there are times when the best tactic is to flee.

A lot of other hardware that can make trading easier is available: missiles, electronic counter-measures systems (to foil incoming missiles), fuel scoops, escape capsules, energy bombs, energy units (to replenish depleted shields faster), docking computers, and galactic hyperdrives. All are expensive, not initially affordable to a novice trader.

If you skim the surface of the sun, fuel scoops allow you to refuel. But the more dangerous pirates are out there as well, so you should be well-armed before you attempt this. Watch the cabin temperature too; if it gets too high, the ship will burn up. A hot cabin may be a blessing, though, should you ever find the ship infested by cute little rodents. (Remember the *Star Trek* episode "The Trouble With Tribbles"?)

As you journey through the galaxy, you'll face some ethical questions. Should you become a pirate yourself? There are many peaceful traders who just want to make a living. They won't attack unless you shoot first. Equipped with a fuel scoop, you can blow them up and scavenge the cargo that remains. If you take this course, expect to see your police rating change from Clean to Offender, and possibly Fugitive. With a price on your head, police ships and bounty hunters will begin to hound you. Another question is whether you should buy and sell contraband, illegal commodities such as slaves, narcotics, and firearms. Such items can bring a high profit, but dealing in narcotics and other illegal items will adversely affect your police record.

A lot of programming skill went into writing *Elite*. But someone also did a lot of work putting together the packaging and documentation. When you open the box, you find a disk, a cardboard overlay for the keyboard, a small plastic Fresnel lens, an instruction sheet for using the lens, a contest entry form, a warranty card, a small poster illustrating the various ships you'll encounter, a reference card summarizing the keyboard controls, a 64-page Space Traders Flight Training Manual, and a 48-page story, "The Dark Wheel." Your first impression is that you've gotten a lot for your money. You needn't read the story to play the game, but it helps set the scene and makes the game seem more real.

The lens is part of an inventive—and highly unusual—copy-protection scheme. When you first load *Elite*, you see a pattern of blocky hi-res graphics on the screen. By holding the lens just right, the blocks form into the letters OK. After pressing RETURN, you should see a password of two letters, which you then type on the keyboard. If you don't have the lens, you can't load the rest of the game.

One thing that seems odd is that when you first save a game position, it defaults to tape. Even though the game loads from disk, you have to tell the save menu that you're using a disk drive. This seems to indicate that there's a tape version available, which isn't surprising considering the game originated in Great Britain, where tape drives are very popular. For a game that's otherwise well planned out and bug-free, this oversight—defaulting to tape on a disk-based program—is out of character.

Everything fits just right. *Elite* is the right blend of action and strategy, with excellent 3-D graphics, good sound effects (one person even described the theme song as the best since *M.U.L.E.*), and great documentation. Let's hope the authors of *Elite* continue to develop games for the 64.

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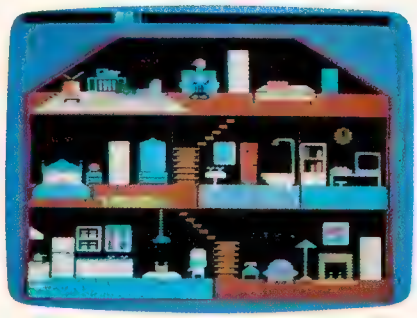

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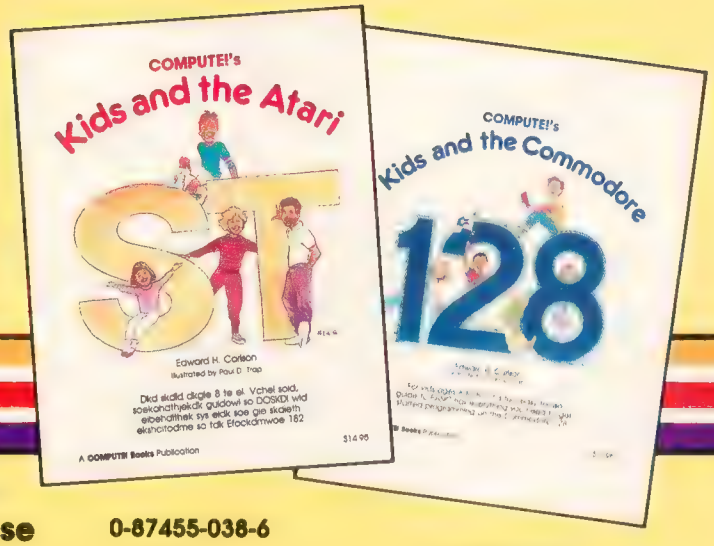

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might feel when you're reading a book or watching a movie. The interactive nature of these games seems to appeal to people who were previously uninterested in personal computers, based on the software they had seen.

Designers at Activision have produced such a program, though, to their telling, they did not set out to write a computer game. The program developers had been puzzling over why perfectly-coded programs kept crashing. They theorized that maybe there were little people living inside our computers, so they designed a comfortable little "house on a disk," hoping to get a glimpse of them.

It worked, and Activision began mass-producing and selling these little houses so that Commodore 64 and 128 owners could meet the little people inside their computers.

Activisions's product, *Little Computer People*, is an engaging, whimsical program. It's not really a game, but it doesn't fit into any other traditional classification for a computer program. It may appeal to people who also enjoy other types of computer games, but may be especially of interest to people who don't usually enjoy them.

The first time you load the program, you'll see the house that the Activision design team built for the LCP's. In a minute or so—assuming there is a little person in your computer—he'll ring the doorbell, then come in and look around. If he likes it, he'll go out, get his suitcase and dog, and move in.

These little people have lots of hobbies. They play games, and may ask you to join. They play the piano, watch television, dance to music from the record player, read the paper, write letters, and, of course, program their computers. They seem to like talking on the telephone, though, so far, no one understands their language. Like real people, little computer people have different names and personalities and physical appearances.

You have some responsibilities as the owner of an LCP. You must make sure they have food and water, or they turn green and look very unhappy. You can send them gifts and play card games with them. But what makes them happiest is when you pat them on the head. All of the interaction between you and your LCP is done with a few keystrokes.

Excellent graphics and sound and a very novel idea make *Little Computer People* a charming, enjoyable program for people of many ages and interests.

—Kathy Yakal

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Ultima IV: Quest of the Avatar

It seems ages since my quest began. Here I stand at the entrance to the Dungeon Destard, with Jaana, a Druid princess who has been with me almost since the beginning; Iolo, a Bard and my loyal companion; and Dupre, a Paladin. I wouldn't have made it this far without Dupre's strength in our many battles.

It's taken us a long time, and we've fought many battles in this strange and supernatural land to prepare for this moment. Do I really want to risk everything by descending into this dungeon? Does the bounty we stand to gain outweigh the risks we must take to survive the terror of the unknown? The journey has hardly begun. After exploring this and other dungeons, if we survive, we still must enter the Abyss for the final confrontation with the unknown. My companions trust me, and look to me for leadership. Am I leading them to their doom or to even greater glory?

Could that other life, so vague now, have really existed? I remember resting on the grass beside a lazy stream, taking a break from cares and worries in some other world. When a portal opened—a gateway between the two worlds—I found the Ankh, a map, and two books: one of magic and the other titled "The History of Brittannia." I had no idea of the journey I was about to begin. I'm glad I read the books. I wouldn't have had a clue of what was to come without their guidance.

What adventures Jaana and I have had fighting the monsters that abound in this mysterious land, exploring the cities and the countryside, meeting other people on similar quests, and discovering more about my purpose and ultimate goal in Brittannia. Brittannia is huge. The map of the known world fills in only a small area, but I've been doing my best to explore the large unknown regions.

It was thought that the evil was stamped out during the Third Era of the Dark Ages—Ultima III—as Iolo the Bard calls it. Of course, that was before we discovered that evil still exists in hidden corners of Brittannia, and is yet quite strong. Our goal is to complete the Quest of the Avatar, and banish evil from this land forever.

Such will be your life, should you choose to begin *Ultima IV*, the latest and the best of the fantasy role-playing games in the *Ultima* series by Lord British of Origin Systems. Originally released for Apple computers, the series is being translated for the Commodore 64. *Ultima III* and *Ultima IV* are available now, and translations of *Ultima I* and *II* should be available later this year. Even if you choose *Ultima IV* for

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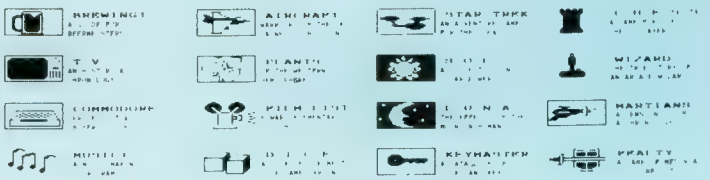

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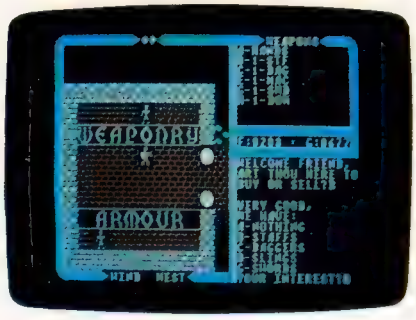
your first adventure in this series, you'll probably want to try the other games in the series.

Destruction is not the key to *Ultima IV*. And not everything you encounter is best killed, as you'll quickly learn. You must live by eight virtues during your quest. It's not easy, and your quest will last a long time. Don't plan on completing this adventure in a weekend.

You see a number of different displays as you explore various parts of Britannia. (The names and state of health of each of the characters in your party is always displayed.) When you move through the countryside, you view a portion of the map of Britannia. As you enter the cities and towns, the



display shifts to a detailed map of the immediate surrounding area within the town.

When you attack monsters, or are unfortunate enough to be attacked, the screen switches to an overhead view of the field of combat. You see each of the characters in your party, and each member of the opposing force. In the dungeons, you're treated to a three-dimensional display of the passages you're moving through. But when you encounter monsters, the display is similar to that of an open field battle.

Communication with the program is easy. The lower right side of the screen is the communications window. Usually a one word command is sufficient, and often one keystroke is all that's required to convey your intentions. A reference card listing available commands is included with the game.

Dungeons and Dragons devotees will enjoy the *Ultima* series, and even beginning adventurers will find themselves captivated by the charm and detail of *Ultima IV*. Don't worry about getting lost; hints are available by calling the customer service department at Origin Systems, and a hints book will soon be available. Even the characters in the game will often give you hints and point the way for your further adventures. Although *Ultima IV* is one of the most complex adventures I've seen, the game is quite easy to play.

Lord British has created what may be the ultimate challenge in graphics and text fantasy role-playing adventures. Give this package some serious thought as your next entertainment acquisition.

—George Miller

Origin Systems, Inc.
340 Harvey Road
Manchester, NH 03103
Distributed by Electronic Arts, Inc.
2755 Campus Drive
San Mateo, CA 94403
approximately $60

also worth noting

Fight Night

Fight Night by Accolade is really two games in one for the Commodore 64. Use the Boxing Construction Set to develop your own boxer, choosing traits such as speed, stamina, intellect, footwork, and fighting style. Then when you're ready, enter your fighter in the Championship round. Train your fighter to prepare for the main event as you work your way up through the ranks. Your fighter will stand toe to toe with five of the roughest fighters around, and battle for a shot at the title as you use your joystick to control every move.

Winning graphics and sound, combined with arcade action and strategy, make *Fight Night* more than a rock-'em sock-'em game. You've got to plan ahead.

Accolade Entertainment Software
20863 Stevens Creek Boulevard
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Homework Helper: Writing And Homework Helper: Math Word Problems

Mathematical word problems and student essays and book reports are subject areas that many youngsters have trouble mastering during their junior and senior high school years. Spinnaker is offering two *Homework Helper* educational programs for the Commodore 64 that provide coaching and practice in both areas for grades 7–12.

Math Word Problems is divided into three areas: a tutorial section about the five types of word problems and how to create equations with each; a hands-on section containing a series of problems to be solved; and a helper section that aids the student in solving his or her own homework problems, and then shows how to print them out. The step-by-step approach is instructive, and program interaction is understandable and easy to follow. A calculator is also built into the program, as are help files.

Writing is based on what is essentially a full-fledged word processor. Questions and suggestions supplied by the program help students learn to create ideas for their book reports and essays, organize those ideas, and then write the reports using the word processor. The program also includes a spelling checker and help files.

For students who need extra help in these academic subjects, Spinnaker's *Homework Helper* packages offer sound, practical, hands-on practice. In a school setting, a teacher may be able to incorporate the programs as supplementary lessons. At home, they may also serve as supplementary study aids. In either case, the programs would appear to work most effectively for students when there is some supportive supervision involved.

Spinnaker plans to offer additional *Homework Helper* titles in this series.

Spinnaker Software
One Kendall Square
Cambridge, MA 02139
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RadarSoft
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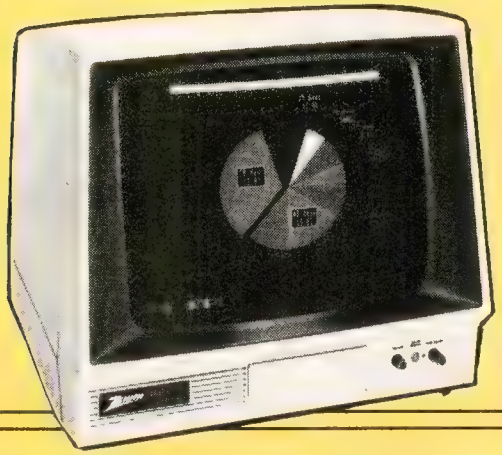

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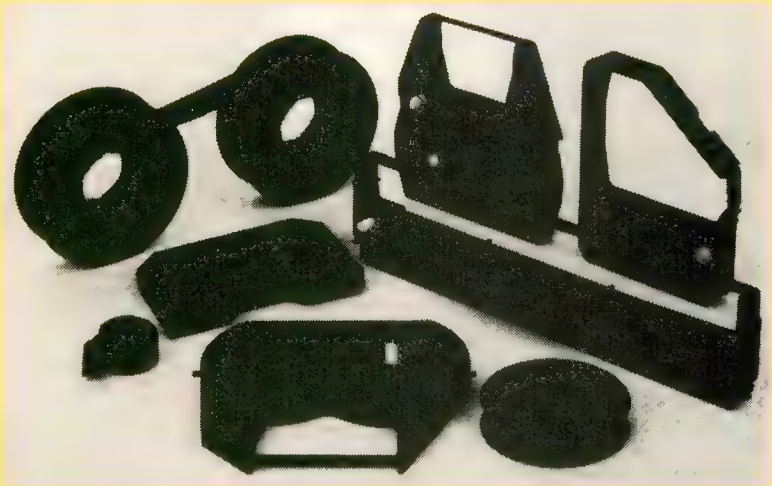

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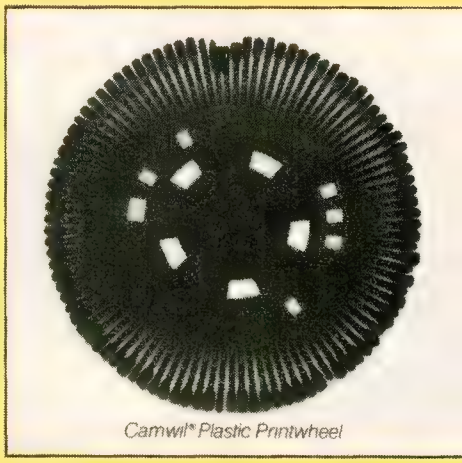

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No. of Char. in Char. Set
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Horizontal 72 DPI Vertical
Pitch
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Impact Dot Matrix

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Printing Features
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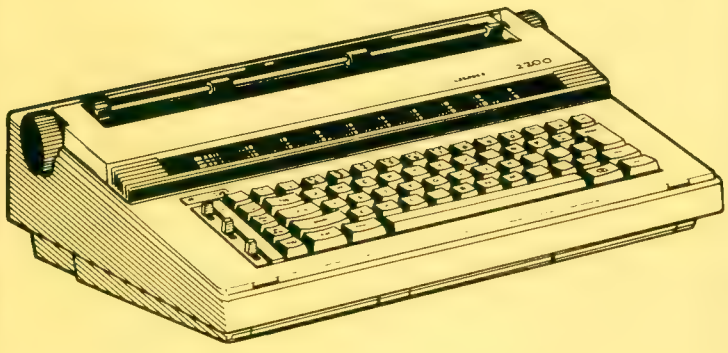

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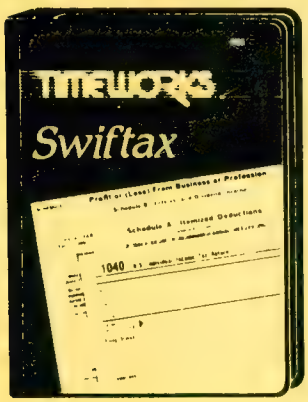

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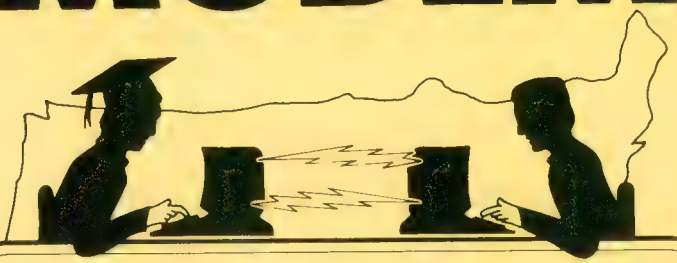

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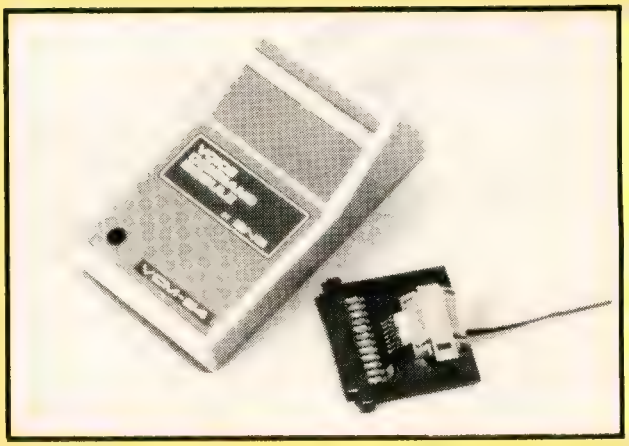

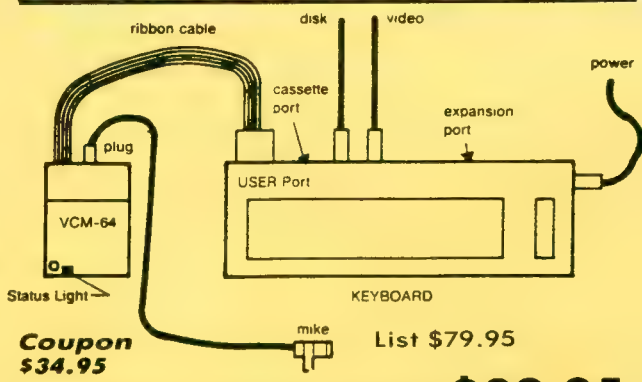

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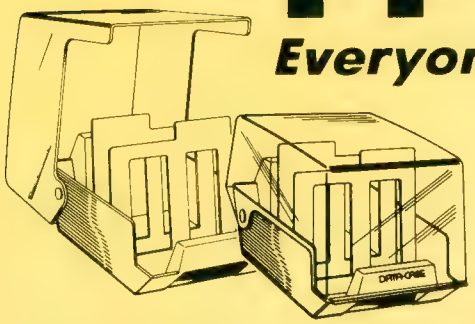

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The Floppy Disk Filer is an inexpensive hard plastic Fliptop case that will allow for easy filing, and protect your disks from dust, smoke, and dirt. Plus, the Floppy Disk Filer will keep all your disks out of unwanted hands and in one place where you can easily find them. **(Holds Over 50 Disks)**

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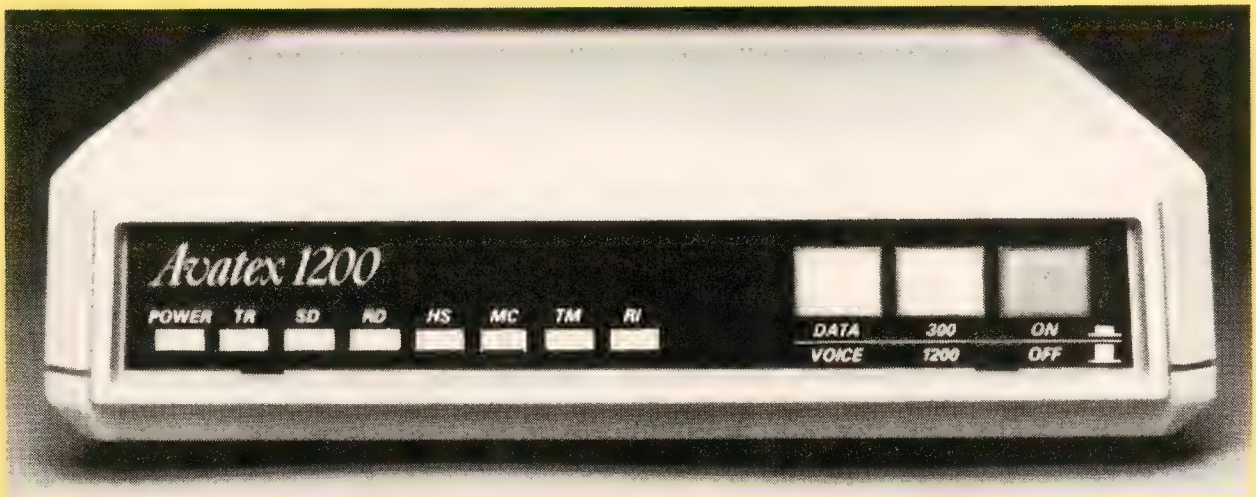
Originally selling for over $300, the Avatex modem can put you and/or your business in touch with the world of telecomputing. With your Avatex 1200 modem you can reach "on-line" business and financial services, professional and educational data bases, or dial up information services. You can play interactive games, "talk" via simulated citizen-band-style conversations, exchange mail electronically ... even operate your own bulletin board service. Whether you're a newcomer or have years of experience in data communications, you're sure to discover something new and fascinating each time you put your Avatex 1200 modem on-line.

The Avatex modem auto dial auto answer requires only an RS-232C interface to hook up to any computer (IBM; Apple; Atari; Commodore, Sold Below; etc.). With on-line data bases like Viewtron and Quantum Link charging $6.00 and more per hour you must buy a 1200 baud modem to save money. **You can transmit/receive in 15 minutes what normally takes 1 hour at 300 baud** List $329.00. **Sale $79.95.**



Power Indicator — Lights up when your modem's power is on.

TR Indicator — Terminal Ready indicator is on when your modem receives the correct signal (data terminal ready signal) from your computer. (If your computer does not provide this signal, the TR indicator lights up when you've "forced" the data terminal ready signal from your modem.)

SD Indicator — Send Data indicator lights up when your modem transmits data.

RD Indicator — Receive Data indicator lights up when your modem receives data over the telephone line.

HS Indicator — High Speed indicator lights up when your modem operates at 1200 bps.

MC Indicator — Modem Check indicator lights up when your modem is on but not in operation. The MC indicator also flashes to indicate an error during automatic tests.

TM Indicator — Test Mode indicator lights up when you are testing your modem.

RI Indicator — Ring indicator flashes when your modem detects an incoming call.

DATA/VOICE Button — Lets you switch from talking (out position) to data transmission (in position) and back again.

300/1200 Button — Gives you push-button control for setting the communication speed to 0 to 300 bits per second (in position) or to 1200 bits per second (out position) when you place a call. Your Avatex 1200 modem will automatically adjust the communication speed to answer an incoming call, regardless of the position of this button.

ON/OFF Button — Turns the power to the modem on and off.

Interfaces

Commodore RS232C	$24.95
Aplus 3000 RS232C	$59.95

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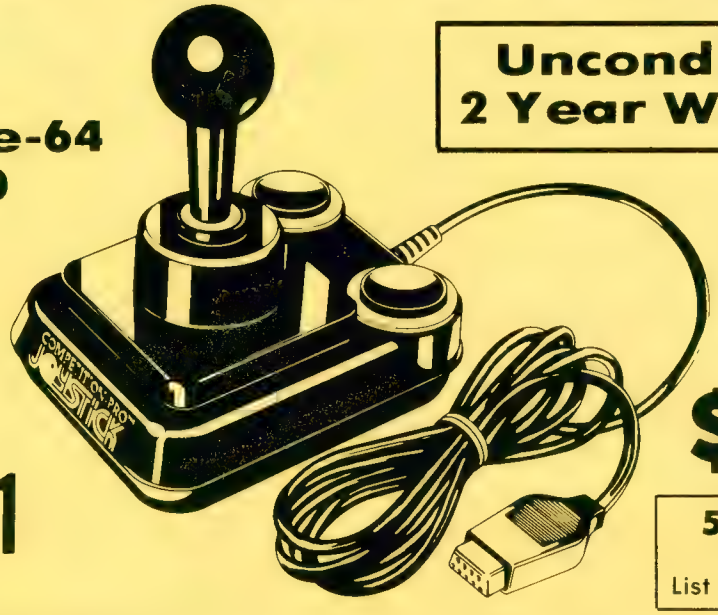

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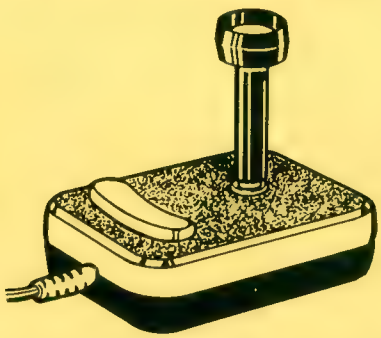

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Keyboard — 40 Keys (A-C) in professional gauge spring loaded to give the feel and response of a real keyboard instrument. Polyphonic.

Registers (with the Conductor) — Organ, Trumpet, Flute, Clarinet, Piano, Harpsicord, Violin, Cello, Bass, Banjo, Mandolin, Calliope, Concertino, Bagpipe, Synthesizer 1, Synthesizer 2, Clavier 1, Clavier 2, which can be played over a 7 octave range. Programmable sounds as well.

Recording (with the Conductor) — Three track sequencer (recorder) with over-dubbing and multitimbral (different instrument sounds at the same time) effects.

Interface — Built in interface for Commodore 64, Commodore 128, plugs right in to joystick port no. 2 and user port.

Finish — Table Model in white high-impact material, with carrying handle, protective key cover, and built in music stand. Size 29 1/8x 9 9/16 x 3-11/16, weighs 9 pounds.

List $159.95 **Sale $69.00**

The Conductor Software

List $29.95 **Sale $19.95**

The Conductor teaches how a composition is put together, note by note, instrument by instrument. You learn to play 35 pre-recorded songs from Bach to Rock. Then you can compose your own songs and record them right onto your floppy disk.

Teaches:
- Scales
- Bass lines
- Familiar Beginner Songs such as "Jingle Bells"
- Easy classical songs such as "Bach Minuet" and Ravel's "Bolero"
- Advanced classics like "A Mid-summer's Night Dream" by Mendelssohn
- Popular hits such as "Thriller"

Create New Instrument Sounds
- Choose from pulse, sawtooth, triangle and noise and sound sources.
- Control the sound envelope with attack, delay, sustain and release times.
- Ring Modulation and Syncronization effects.
- Set Low pass, band pass, and high pass filter frequencies.

Recording Functions:
- Monitor: Lets you use a track to play music live, without recording it.
- Record: Records a track as you play.
- Playback: Lets you hear whatever has been recorded or loaded into the track. You may playback one track while recording another to build layers of instruments.
- Mute: Turns a track off. This is useful when you want to listen to a record one or two tracks at a time.
- Save: Stores a track to the disk.
- Load: Loads a track from disk.
- Protect: Write protects a track.

The Conductor Requires:
- Commodore 64 or Commodore 128 with disk drive.
- The Commodore Piano Musical Keyboard is required to study the reading and playing of musical notes.

The Printed Song

List $29.95 **Sale $19.95**

With the Printed Song program your music can be printed out in music notation, which other musicians can read and play. Any music recorded with the Conductor program can be printed by the Printed Song.

The Printed Song Requires: • Commodore 64 or Commodore 128 with disk drive and printer compatible with the Commodore graphics mode such as the Commodore MPS 803, 1515, and 1525. • The Conductor program.

The Music Teacher Software

List $39.95 **Sale $29.95**

The Music Teacher teaches a beginner how to read music and play it correctly and in rhythm on the musical keyboard.
The Music Teacher will have you reading and playing musical notes in minutes with fun and excitement.

Features: • Trumpet, organ, violin, and synthesizer instrument sounds. • Built in metronome. • Pause/Play control. • Set-up menu for customizing The Music Teacher.

Teaches: • How to read notes on the treble and bass musical staffs. • The names of the notes. • Where the notes are on the keyboard. • How to play whole notes, half notes, quarter notes, eighth notes and sixteenth notes in combinations in both 3/4 and 4/4 time. • How to play in different tempos.

Requires: • Commodore 64 or Commodore 128 with disk drive. • The Commodore Piano Musical Keyboard

The Technician

List $29.95 **Sale $24.95**

Contains programs, and BASIC source listings for reading the Commodore Piano Musical Keyboard, and for reading and creating music files for the Conductor.

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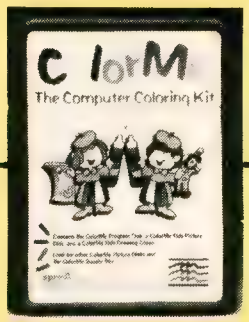
Crossword Magic — Create your own crossword puzzles. A unique way to study any subject in any language. Crossword Magic can be used again and again by every member of the family. (Disk) List $49.95. **Sale $29.95.**

The Perfect Score: Computer Preparation For The SAT — The most complete Computer program for preparing for the SAT test. This package contains **six** double sided disks covering all sections of the test. Timed exam included. (Disk)
List $69.96. **Sale $45.95.** *Coupon $42.95.*



ColorMe with Rainbow Brite Picture Disk — Your young children can enjoy hours of creativity as they draw and color. They can draw freehand or use predrawn pictures from the Rainbow Brite picture disk included with ColorMe (ltd. qty.) (Disk) List $34.95. **Sale $18.95.**

The Halley Project: A Mission In Our Solar System — Pilots are needed for a top-secret space exploration mission. Only the most skilled will be accepted. To qualify you must pass a series of tests. As you travel through the solar system your only guide is a radarscope and an ability to navigate by the stars. (Disk) List $39.95.
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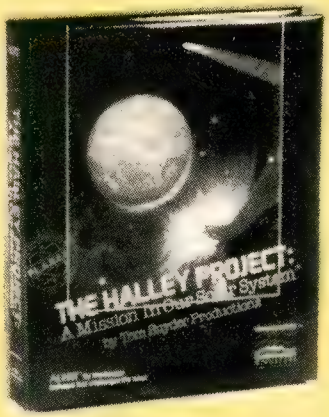
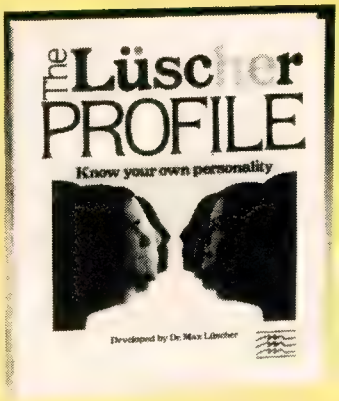
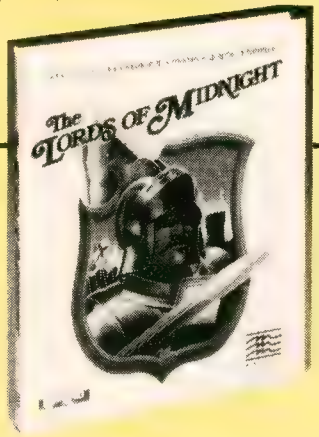


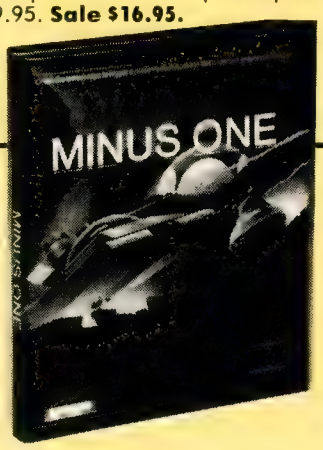
The Luscher Profile — Wouldn't it be great if you could run a personality profile on those who confuse you most? To understand the traits behind the reactions of your spouse, child, parents, in-laws, or best friend? If someone has you in a quandry then this program will help you to answer the probing question, "what makes him tick?" With 35 years of research on the theory of how psychologically revealing a person's color and shape choices can be, Mindscape created the program The Luscher Profile to reflect that discovery. (Disk) List $39.95. **Sale $28.95.**



The Lords Of Midnight — The land of Midnight is controlled by Doomdark and your mission in causing his fall from power is to destroy the source of his strength, The Ice Crown. Battle 32,000 panaramas creatures. Courage and bravery will hopefully see you through. (Disk) List $19.95. **Sale $16.95.**



Quake Minus One — You must stand up to a vicious terrorist group bent on gaining control of the Titan Power Station and causing an extremely destructive earthquake. You have only ten hours to figure out a solution to this probable devastation. First you must destroy four Titan computers, then stop the quake. (Disk) List $19.95. **Sale $16.95.**



Shadowfire — This game allows you 100 real-time minutes to rescue Ambassador Kryxix and demolish the enemy starship. The aliens that confront you are beyond the realm of the most vivid imagination The pace is fast and the action intense. (Disk) List $19.95. **Sale $16.95.**

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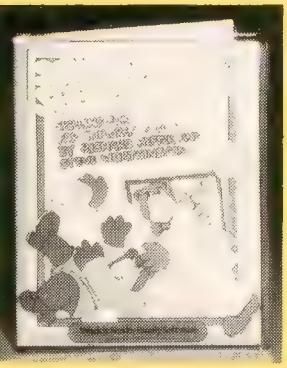
Stickybear Typing — Stickybear makes learning the keyboard both easy & fun for anyone. A 3 game format provides different levels so that as typing skills improve so does the level of difficulty. ***Stickybear Keypress*** is geared to the needs of the child or the beginner, the stress is on the keyboard. To increase typing speed and accuracy the fast-paced ***Stickybear Thump*** will provide a real challenge. ***Stickybear Stories*** allows further practice with real text for timed practice. Everything from jokes, stories and bright amusing graphics make this one of the most delightful typing programs ever, plus you can keep track of your progress and store on disk. (Disk) List $29.95. **Sale $19.95.**



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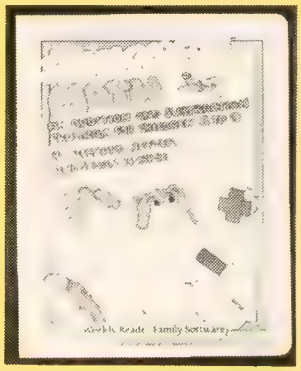

Stickybear Spellgrabber — 3 games in one: Picture Spell contains over 200 word/picture combinations. Word Spell is a scramble game, players recreate words shown on the screen. Bear Dunk involves guessing a word to save Stickybear from a dunking. (Disk) List $29.95. **Sale $19.95.**

Stickybear Math — Kids learn math skills as they help the Stickybear Family out of sticky jams. For every set of addition and subtraction problems youngsters get right, Stickybear gets a step closer to getting out of the jam. (Disk) List $29.95. **Sale $19.95.**

Stickybear Town Builder Kids develop essential map skills as they build a town with roads, parks, airports, bridges, etc. and save on disk. That's just the first game. In Take A Drive, Compass-reading and directions are stressed. With Find The Keys, follow clues to locate mystery keys. (Disk) List $29.95. **Sale $19.95.**

Stickybear Reading
3 fun activities that build reading comprehension skills. Match The Words: Kids practice vocabulary as they match up word and picture sets. Find The Word: Turns the words in a sentence into animated action. Build A Sentence: Children choose a subject, a verb and an object, then watch them turn into a picture. (Disk) List $29.95. **Sale $19.95.**

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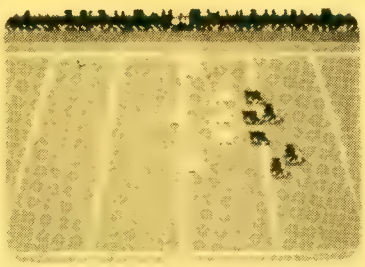
Sky Fox — Fly the unfriendly skies in this incredibly realistic flight simulation program. You are fighting to protect your home base with five kinds of weapons and working gauges. The high speed animation and breathtaking graphics are up to arcade standards. Features 5 skill levels and 15 different scenarios, each requiring a different strategy. This best selling game is a sure winner. (Disk) List $29.95. **Sale $23.95.** *Coupon $22.95.*

Super Boulderdash — The exciting sequel to one of the most action packed strategy games ever. With 16 new maze levels, so complex and challenging that you will soon become a fan. The original was an award winner with characters like the enchanted wall and the boulders that fall when you least expect it. You must find the way through the caves while gathering jewels, all the time working against the clock. (Disk) List $29.95. **Sale $22.95.**

Commodore 64 SALE

Action

Touchdown Football — Enjoy football all year long with this fast action program that brings all the elements of the game to your home computer. It's all here, the realism of great graphics and sound that put you on the turf with the NFL all stars. 100's of plays for both the offensive and defensive teams, plus the ability to play a game against another fan or the computer. (Disk) List $29.95. **Sale $22.95.**



Racing Destruction Set — Put yourself behind the wheel of the vehicle of your choice, build the racetrack and add the obstacles. Then prepare for the race of your life. This split-screen, computer slot car racing set is for two players. You'll encounter oil slicks and weapons and have to be on guard for ice, and hairpin turns. (Disk) List $29.95. **Sale $22.95.**

Graphics

Heart Of Africa — The exiting sequel to "The Seven Cities Of Gold" has you exploring the Dark Continent in the 1890's. Your mission is to find the lost temple of Ankh-Ankh. You'll encounter cannibals, slave traders, hunger and wild animals, to name a few. Historically and geographically accurate, so you gain education as you have fun. (Disk) List $29.95. **Sale $23.95.**

Movie Maker — Create your own animated movies complete with sound effects. Animate your own drawings or select from an endless supply of built-in pictures. After you're finished, save your creations on disk. Up to six characters per movie and 10 built-in movies to let your imagination run wild. (Disk) List $29.95. **Sale $23.95.**

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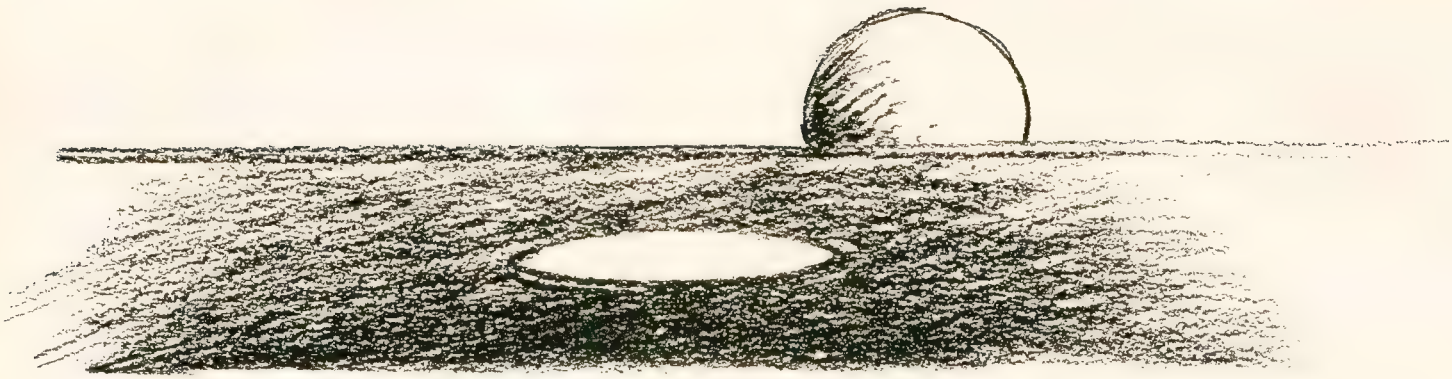
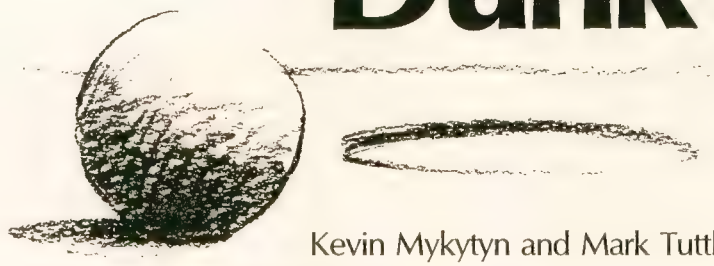


Dunk



Kevin Mykytyn and Mark Tuttle

Consider yourself warned: This game is very difficult to master. Even the most ardent game-players will find it a great challenge. For the 64; a joystick is required.

"Dunk" will challenge any previous conceptions you may have had about your joystick. Pressing up may move your player down while pressing left may move you right. And just when you think you have the pattern mastered, it changes.

The game is written entirely in machine language, so "MLX," published frequently in COMPUTE!'s GAZETTE, is required to type it in. After loading and running MLX, answer the prompts for starting and ending addresses with C000 and C74F respectively. Type in Dunk and save it to tape or disk. To run it, type LOAD "*filename*",8,1 (disk) or LOAD "*filename*",1,1 (tape) and SYS 49152.

A Few Rules

The gameboard consists of three square platforms, stacked one on another. Each platform has four edges, which you must avoid. Anytime a ball falls off the edge, it's lost forever and you score no points.

The top two platforms have openings through which a ball can fall to the next level. During the course of the game, 25 balls enter the playing field from the top of the screen. Each lands somewhere on the top platform and begins to roll toward either the left or right edge, whichever is farthest away. The object of the game is to steer the balls into the openings so they fall to the next level. When a ball reaches the bottom platform, try to knock it into one of the scoring slots on the righthand edge (scores are indicated by the numbers 1, 2, and 3). A ball that goes over the edge yields no points.

You control three small cubes, one on each level, for steering the balls into the holes. To push one of the balls with your cube, position the cube on top of the ball and then move the cube in the direction you want the ball to travel. This may not seem very difficult, but remember that you're controlling all three cubes at the same time. If you push a ball on the top level, you may unintentionally change the course of a cube on the middle or bottom level. If you then try to correct the movement of the ball on the bottom level, you may accidentally divert the ball on the top platform. It's maddening.

And If That Wasn't Hard Enough

There is one more thing you must take into consideration when moving each of the cubes. The cube on the middle level, the red one, moves exactly the same as the joystick: You press up and the middle cube moves forward; pull to the left and the middle cube goes left.

The cubes on the top and bottom levels are less accommodating. They may move correctly, the same as the middle cube. Or they may move in the opposite direction. It takes a little while to learn how each of the cubes behaves. Even after you've gotten the knack, every time you score a point, the patterns change.

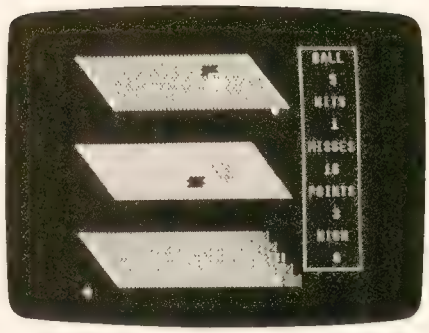
Scoring Strategies

The numbers on the right of the screen keep track of the number of

balls remaining, the number of hits (balls which have scored), the number of misses (balls that have fallen off the edge), number of points, and the high score.

To score points you must successfully steer a ball from the top platform to the middle and bottom levels and then knock it into one of the scoring slots. The maximum number of points is three, so the highest score possible for 25 balls is 75. Actually, any score over 40 is incredible, and a score over 50 approaches a miracle. Don't expect to get many scores over 5 the first few times you play.

Although this first strategy may sound obvious, it's very important: Watch only one ball at a time when you're beginning to learn the game. Trying to keep track of two or three balls on separate levels is too hard.



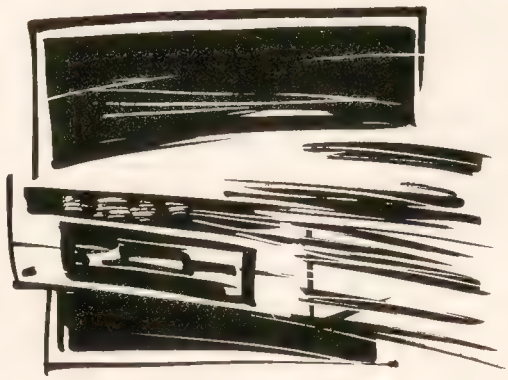
The player is about to score on the bottom platform, but elsewhere things aren't going so well.

Second, always try to score as much as possible with the balls on the bottom level. If you've guided a ball to the bottom level, you may as well get 3 points for it.

The maximum number of balls you'll see on the screen at one time is five, and five balls are hard to keep track of—especially when they're moving in different directions on different platforms with the joystick running backwards. The solution is to simplify, to consolidate the balls into *blobs*. We recommend that you learn the art of steering balls so they collide with each other, and subsequently stick to each other to form a blob. Blobs of two or three balls are commonplace, while a blob of five is something few mortals have seen. This final tactic is one that will make a bad dunker good, and a good dunker great.

See program listing on page 110.

Turbo Copy



A. M. Cutrone

This utility is a *must* for all 1541 disk drive owners with Commodore 64's. It copies an entire disk in only four and a half minutes—and formats the disk as it copies.

Commodore owners know that the 1541 disk drive is extremely slow. It's especially frustrating when you're copying disks. Using a copy program is much easier than having to load, switch disks, and save for each program. But a normal copy program can take up to 20 minutes to copy a single disk. Now there's a better way. "Turbo Copy" temporarily turbocharges your 1541 disk drive to make a copy in just four and a half minutes. That's a speed increase of over 400 percent.

Using It Correctly

The program is written entirely in machine language. "MLX," published frequently in COMPUTE!'s GAZETTE, is required to type it in. After loading and running MLX, answer the prompts for starting and ending addresses with 0801 and 1210 respectively. Type in Turbo Copy and save it to disk. To run it, type LOAD *"filename"*,8 and RUN.

Turbo Copy copies all sectors from the source disk to the destination disk, whether or not the sectors are used by a program. Thus, if you wish to back up a disk that contains only one or two short files, you might save time by using a file-copy program instead of Turbo Copy.

It's necessary that you have only one peripheral active on the serial line. If you have a printer or extra disk drives, they must be turned off. If you use a printer interface, make sure that it is turned off also (better yet, disconnect it entirely). Failure to do this will cause Turbo Copy to work incorrectly. Also, make sure that there are no other

programs or cartridges in the 64 when you use Turbo Copy. Turbo Copy uses all available RAM in the 64, so any programs, even hidden ones, might cause it to crash. So, before using Turbo Copy, shut off the 64, remove any cartridges, make sure that any printer interfaces are not connected for power (like those that use the cassette port), and that every peripheral on the serial port is turned off except for one disk drive.

Turbo Copy is easy to use. After running the program, you'll see a title screen. After a short wait, the disk drive will knock, assuring you that all is well. You're then asked to place the source disk (the disk you want to copy from) into the drive and press RETURN. *To be safe, make sure you've covered the write-protect notch on the source disk to avoid accidentally writing to it.* You'll note that the drive keeps spinning. Don't be alarmed; this is normal for Turbo Copy. After you press RETURN, Turbo Copy begins reading the contents of the disk into memory. Each time a sector on the disk is read into memory, the color of the screen will change and the red light on the disk drive will flash. Normally, the flashing red light indicates a disk error, but you should ignore it when using Turbo Copy.

After about 30 seconds you'll hear an audio cue and be prompted to insert the destination disk (the disk you are copying to) and press RETURN. Make sure the destination disk doesn't contain any programs unless you don't mind if those programs are erased.

One minute later, you'll be asked to switch disks again. The same happens two more times until the copy is complete, at which time you'll be asked if you want to make another copy. If you type Y, Turbo Copy will restart. Any other response will result in a reset of the machine.

Turbo Copy may seem as though it has a tendency to knock the drive for no apparent reason. It does this to properly align the read/write head after a different disk is placed in the drive. Consider this normal behavior.

It's not necessary to format a disk before you use it with Turbo Copy. Turbo Copy automatically formats each sector as information is written. You can use a new disk right out of the box. There is also very little that can go wrong while using Turbo Copy. All normal read errors can be read by Turbo Copy, but unlike other copy programs, Turbo Copy goes on when it finds a read error. It doesn't even bother stopping to tell you it has found a read error (although the drive will knock). Turbo Copy is equipped to deal with such errors.

Writing, on the other hand, is a different story. Since Turbo Copy formats the destination disk as it writes, the only way a write error could occur is if there was no disk in the drive, the drive door was left open, or a write-protect tab was on the disk. These conditions cause Turbo Copy to stop and ask you either to quit or to start again.

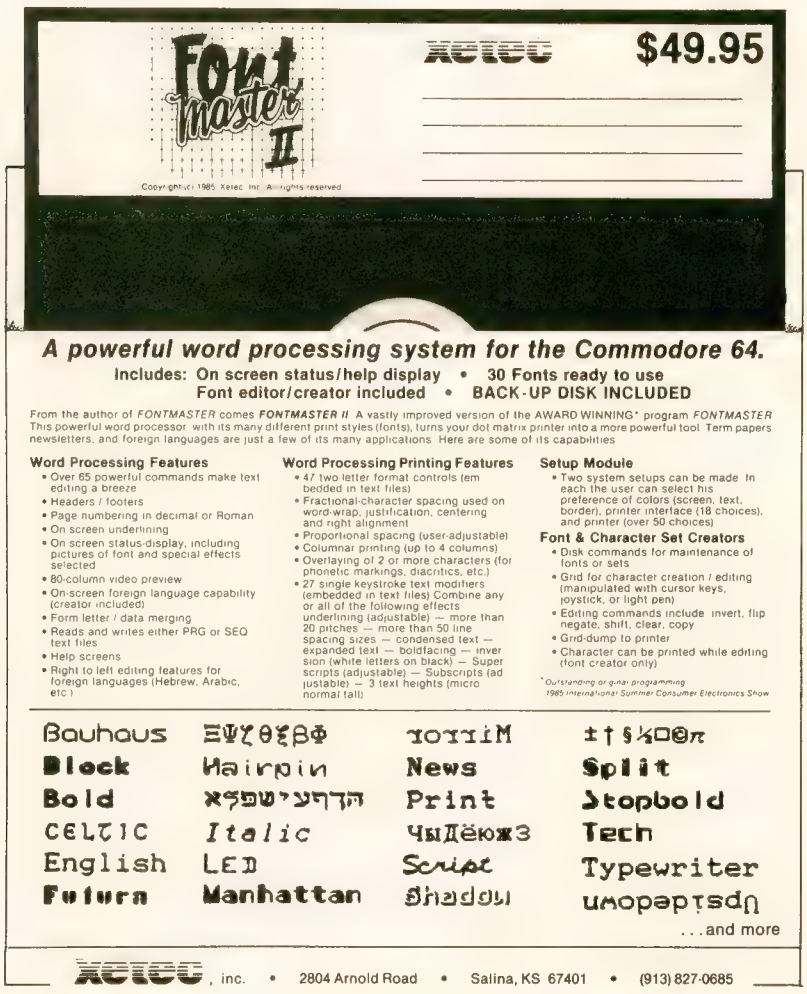
If a read error was found when reading the source disk, Turbo Copy will skip over the corresponding sectors when writing to the destination disk. If the destination disk was previously unformatted, this will effectively put a read error on the destination disk in the same spot as was found on the source disk. If the disk was already formatted, the track or sector will be left alone, although the IDs will probably not match. This might cause a read error when the drive tries to access the track or sector and finds a different ID.

How It Works

Turbo Copy works in conjunction with the disk drive to effectively speed up data transfer more than four times. Basically, this is done by reprogramming the disk drive to send two bits of data at a time instead of one.

Normally, a single bit is sent over the data line of the serial port. Turbo Copy sends and receives two bits of data, one on the data line, and one on the clock line. More than half of Turbo Copy is sent to the disk drive and stored in its RAM. It is this data that tells the disk drive what to do. Because the drive has to be reprogrammed, it will not function correctly for normal operations after you leave Turbo Copy. It must be turned off and then on again.

See program listing on page 111.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Word Processing Features
• Over 65 powerful commands make text editing a breeze
• Headers / footers
• Page numbering in decimal or Roman
• On screen underlining
• On screen status-display, including pictures of font and special effects selected
• 80-column video preview
• On-screen foreign language capability (creator included)
• Form letter / data merging
• Reads and writes either PRG or SEQ text files
• Help screens
• Right to left editing features for foreign languages (Hebrew, Arabic, etc.)
Word Processing Printing Features
• 47 two letter format controls (embedded in text files)
• Fractional-character spacing used on word-wrap, justification, centering and right alignment
• Proportional spacing (user-adjustable)
• Columnar printing (up to 4 columns)
• Overlaying of 2 or more characters (for phonetic markings, diacritics, etc.)
• 27 single keystroke text modifiers (embedded in text files) Combine any or all of the following effects underlining (adjustable) — more than 20 pitches — more than 50 line spacing sizes — condensed text — expanded text — boldfacing — inversion (white letters on black) — Superscripts (adjustable) — Subscripts (adjustable) — 3 text heights (micro normal tall)
Setup Module
• Two system setups can be made. In each the user can select his preference of colors (screen, text, border), printer interface (18 choices), and printer (over 50 choices)
Font & Character Set Creators
• Disk commands for maintenance of fonts or sets
• Grid for character creation / editing (manipulated with cursor keys, joystick, or light pen)
• Editing commands include invert, flip, negate, shift, clear, copy
• Grid-dump to printer
• Character can be printed while editing (font creator only)
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All About CP/M On The 128

Howard Golk

CP/M is one of the oldest operating systems—but one of the newest available for Commodore users. This article, especially for new 128 owners, includes lots of practical examples, useful tips, and helpful notes on available CP/M software.

The Commodore 128 brings something very new to Commodore users: CP/M (Control Program for Microcomputers). Although CP/M was briefly available for the 64, it was a poor version which conformed to only a few of the standards for truly compatible CP/M software. With the 128 and 1571 disk drive, a 100 percent compatible version of CP/M has arrived. You're probably aware of the thousands of programs that run under CP/M. But before you invest a lot of time and money, there are a few things you should know about what CP/M is—and more importantly, what it is not.

A Fundamental Difference

All computers have an Operating System (OS). The OS handles all the primary input, output, and housekeeping operations. When you type LOAD and press RETURN on a Commodore 64, you're instructing the OS to locate and read in a program from tape or disk. The OS is responsible for all communication between your programs and peripherals, such as the disk drive and display screen.

There are many different kinds of operating systems. Commodore computers have always had *dedicated* operating systems, that is, each model (PET, CBM, 64, VIC-20, and so on) contains its own customized operating system. Because software written for dedicated operating systems is not transportable from one machine to another, each model requires its own library of software. PET programs didn't run correctly (if at all) on 8032s or VICs and vice versa. Many other popular computers also have dedicated operating systems: Apple II, Atari, and Timex/Sinclair to name a few.

CP/M, however, is a transportable operating system. It was not written for any one particular computer. The idea is that programs written for an Osborne can theoretically be run on a Kaypro, Sanyo, Heathkit, or any other computer with CP/M. The early CP/M machines employed a standard eight-inch disk format (IBM-34). (Incidentally, the first CP/M machines were very expensive because they required 64K of memory, a massive amount at the time, to operate.)

Commodore operating systems are ROM based. The entire OS (which is mostly a collection of small machine language programs) is stored on chips inside the machine. This method of storage has many advantages. The computer generally performs fast and all system commands are available at all times. However, ROM- based operating systems have a few disadvantages. Because the OS is stored on chips, it must be relatively small. ROM-based systems also are more difficult to upgrade or expand since this requires adding or replacing chips in the computer.

An alternative is a RAM-based operating system like CP/M. Rather than put the machine code that makes up the operating system on chips, the code is on disk instead. RAM-based operating systems can generally be much larger than those which are ROM based—which means you can have many more commands and utilities. Upgrading RAM-based operating systems is much easier—you simply add or replace files on the system disk. The disadvantage to this kind of OS is that you amass a lot of system disks. These can sometimes be a source of frustration when you're doing routine jobs like copying files. Disk capacity is also a problem, since the OS can easily use up half the space on a disk. But once a program is running, the system disk is no longer required and can be removed. In fact, the system disk is useless while an applications program is running.

CP/M Vs. Commodore

CP/M has many interesting advantages over dedicated operating systems like Commodore's. Not all of these advantages are features of CP/M particularly. Many are the results of the efforts toward compatibility with dozens of different computers by clever hardware and

software developers.

Commodore users are accustomed to software that needs no installation. You just insert the program disk, type something like LOAD"*",8,1, and you're on your way. This is rarely the case with CP/M programs.

Software packages for CP/M computers must be installed for the particular hardware they're to run on. Since this process is required for compatibility, it gives every program the capability for a large degree of customization. For example, you can generally run CP/M software with any combination of disk drives. You tell the software which drives to use and how to access them. This eliminates a problem common to dedicated operating systems. All too often your software expects specific hardware devices to be used. If your hardware is unusual in any way, you may be stuck. For example, some Commodore programs are designed to operate with a dual disk drive, but not two single drives.

When you install software, you provide it with the codes and parameters used by your hardware to do such things as clear the screen and move the cursor. Business software is usually without color, yet color can be added to many CP/M business programs by the user. This is possible because CP/M programs must be installed for your terminal (screen). While you're identifying the codes to use for things like reverse, underline, etc., you can insert a few color codes.

Software is not easy to install if you're new to computers (it's often difficult for experts, too). CP/M requires a lot more dealer support, especially when installing the software. This is one of the reasons you'll find CP/M software to be more expensive than software for the Commodore 64. New 128 owners will quickly learn that many good CP/M programs can successfully be installed *only* by the dealer.

Since the early days of Commodore, users have often preferred non-Commodore printers. Because of this, software developers for Commodore computers began providing several versions of their programs—each for a different printer. Eventually, these developers provided a method of defining the printer control codes yourself for printers not on the list. With CP/M computers, everything is handled this way. The screen, printer, disk drives, memory capacity, and keyboard are all redefinable.

CP/M Command Structure

CP/M is disk-based. Much of CP/M is located on the disk in the form of *COM files* (command files). When you type a command on the keyboard, the computer looks for a program on the disk by that name.

With CP/M commands, you can place a parameter after the command, and the operating system will pass that parameter to the command program. For example, if you type "DUMP MYFILE", the "DUMP.COM" program is loaded into memory and "MYFILE" (the parameter) is passed to it. In this case the DUMP program will send the contents of "MYFILE" to the screen.

With CP/M, many applications programs depend on the operating system for part of their operation. Don't be surprised if a program you buy requires you to supply your own text editor to create and update data files. *CBASIC* from Digital Research is such a program. The CP/M disk itself includes a general-purpose text editor called "ED.COM", but reviews of this program are not exactly raves—just typing up a grocery list can be a nightmare. Nonetheless, it does allow you to manipulate text files.

One immediate use for a text editor is to create *batch files*. These are completely new to Commodore-only users—and they're extremely useful. All computers include commands for formatting disks, copying files, erasing files, loading programs, and so on. Many common housekeeping jobs require you to sequentially execute a series of these commands. Each time you perform a routine task (like making backup disks) you must type the list of commands in one at a time. With CP/M, you can put a long list of these commands into a disk file, then execute all the commands in the file by simply typing the filename (you may have to precede the filename with the word SUBMIT—depending on how your system is set up). The file that executes a series of commands is a batch file.

Batch files can even use variables as parameters. That way the same batch file can perform a long series of system functions on different groups of files. In a sense, then, CP/M is both an operating system and a simple programming language. Under CP/M you can write programs that run other programs. As an example, suppose you have a batch file on your system disk called "PURGE.SUB" that contains:

```
PIP B:$2 = A:$1
ERA A:$1
```

The "$1" and "$2" are variables. When you type the batch filename followed by one or more parameters, the parameters will take the place of the variables. If you type: **PURGE SOMEFILE ANYFILE**, the result would be the same as if you had typed:

```
PIP B:ANYFILE = A:SOMEFILE
ERASE A:SOMEFILE
```

"PIP" will copy SOMEFILE from drive A to drive B and rename it as ANYFILE. "ERA" erases SOMEFILE on drive A. One of the nice features of CP/M is that you can rename commands. Try this:

```
RENAME COPY.COM = PIP.COM
```

Now you can use "COPY" instead of "PIP". All other aspects of the command remain the same. Of course, if you used the PIP command in any batch files (like the one above), they would have to be changed. Alternately, you can have *both* by making a copy of "PIP.COM" instead of renaming it (that is, PIP COPY.COM = PIP.COM).

The Transition

CP/M's design seems rather alien if you learned on a Commodore system. The disk system will no doubt be frustrating, especially with only one disk drive. Since CP/M is disk based, your disks are cluttered with "system utilities." To execute most CP/M commands, a COM file must be on the disk you're using. This can be maddening—often a Catch 22 situation. You place utilities (COM files) on disks, execute them, then erase them to free up disk space. You could, of course, just leave all your COM files on all your disks, but there would be little or no room left for your programs and data.

The CP/M operating system takes disk drives very seriously. Commodore's disk operating system (DOS) stores only a few items of information about files on a disk. Only the name, type, and size of the file are stored in the disk's directory. CP/M disks have a much more sophisticated directory. Commodore users will find a lot of new features with CP/M directories: Here's a sample:

```
Directory for Drive A: User 0

Name          Bytes  Recs  Attributes  Prot    Update           Access
DITS    BAK    1k     1    Dir RW      read  09/01/82 13:04   09/01/82 13:07
SETDEF  COM    4k    29    Sys RO      none  08/25/82 13:07   09/01/82 03:30
PURGE   SUB    1k     1    Dir RO      none  10/02/85 14:50   10/02/85 14:50

Total Bytes     = 6k    Total Records = 31      Files Found  = 3
Total 1k Blocks = 6     Used/Max Dir Entries for Drive A:  11/64
```

You can mark individual files as "read only" and prevent them from being altered or erased. You can hide files so they do not show up in the disk's directory. You can even give files a password. CP/M will tell you the date and time a file was created and last updated (or the last time it was read). CP/M even knows if a file has been altered since the last time it was copied, which is a handy feature when updating backup disks.

CP/M computers often employ hard disk drives. To help organize the potential thousands of files on one disk, CP/M allows you to break up the directory into 16 "user areas." Essentially, the computer treats each directory as a different disk. To change user areas, type: **USER n** where n is a number from 0 to 15. User areas can be troublesome. When reformatting an old disk, you might erase important files because they're listed in another user area. To see the entire directory, type:

```
DIR [USERS=ALL]
```

Mountains Of Software

Why use CP/M anyway? Software—and lots of it, thousands of programs that do a multitude of things. If you need a program that calculates the net capacity of an oval salad bowl, or the number of toothpicks required to build a full-size boat, chances are there's a CP/M program out there to do it. Before you begin digging through the heap of available CP/M programs, let's look at a few items which might be of interest.

WordStar from MicroPro. Nearly every CP/M computer system contains a copy of this extremely powerful word processing program. It's so popular that it's almost become part of the CP/M standard. There is a close copy of *WordStar* called *NewWord* (from NewStar Software). It has some interesting advantages over *WordStar*, especially for systems with advanced features like those found on the new 128. When properly installed, *NewWord* shows bold and underlining on the screen. It's a true "what you see is what you get" word processor.

MBASIC-80 from Microsoft. There are thousands of programs written in *MBASIC*. Commodore users will quickly notice the lack of a screen editor. Many programmers use *WordStar* (or another text editor) to enter and edit BASIC programs. This is possible because *MBASIC* can optionally read and write program files in text form (nontokenized). This also makes it easy for BASIC programs to write other BASIC programs.

Turbo Pascal from Borland International. Many 128 owners will have purchased their machines specifically to run this fast and powerful language. It has many outstanding features and sells for under $50. If you write large programs, consider Pascal as an alternative to BASIC. Many consider that *Turbo Pascal* is fast becoming *the* definitive language for CP/M (and MS DOS) computers. *Turbo* is even suitable for developing advanced programs like word processors and spreadsheets.

SuperCalc from Sorcim. An outstanding spreadsheet, powerful enough to be used even to work out math routines in your BASIC or Pascal programs. Like *NewWord*, *SuperCalc* is an "enhanced" version of another program, *VisiCalc* (from VisiCorp). *SuperCalc*'s documentation is built-in to the program itself. You can press the "?" key any time for instructions.

dBASE from Ashton-Tate. This is a simplified programming language designed specifically for database applications. You can learn to program *dBASE* in a fraction of the time required to learn an actual computer language.

What is CP/M best for? Business. Word processing and database programs run especially well under CP/M. The 80-column screen is considered a *must* for business applications. You won't find a lot of arcade-style games for CP/M, but you will find some excellent and lengthy adventure games (by John O'Hare). In general, graphics programs are few and far between.

Although we've mentioned BASIC and Pascal, you can get almost *any* language for CP/M, including Forth, C, PILOT, Logo, COBOL, FORTRAN, and many more. There are hundreds of user groups for CP/M also. Most offer free advice, technical information, and public domain software.

Hands On

Let's switch on your Commodore 128 with the CP/M disk in the drive. The computer will automatically come up in CP/M+ mode (also known as CP/M 3.0).

If you do not have an RGB monitor connected to your 128, something is rather odd from the start. The 40-column screen shows only half of the computer's screen. The other half is sitting invisibly off to the right. If you move the cursor more than 39 characters to the right, the screen will shift over for you (to move more quickly, hold down the CTRL key and press the cursor-right or cursor-left key on the top row of the keyboard). Why only half a screen? Because most CP/M computers have 80-column screens. Also, many CP/M programs format their output for an 80-column screen. This strange compromise was the result. It's best either to buy an RGB monitor or to

connect the 80-column output to a monochrome monitor. (See your Commodore dealer for a special cable. The 80-column cables are available from at least three sources: Batteries Included, Cardco, and Microvation.) If you already own a color monitor, you can get 80 columns (in black and white only) with such a cable.

CP/M filenames contain three parts:

D: DRIVE: Each disk drive is identified by a letter. The first drive is drive A, the second is B, and so on. The drive letter is always followed by a colon. In filenames, the drive letter identifies the location of the file.

FILENAME The filename can be from one to eight letters long. It can contain the letters A to Z, numbers 0–9, and a few punctuation symbols. To be safe, do not use punctuation symbols in filenames. Usually, case is not important. CP/M translates lowercase to uppercase for all CP/M utilities. However some programs (like *MBASIC-80*) allow upper- and lowercase filenames, but if used, CP/M utilities will not be able to access them.

.EXT A three letter extension is optional (with a few exceptions). It usually identifies the type of the file. For example, all word processing files could have an extension of ".TXT" (for "text"). Or ".DAT" for data files, ".BAS" for BASIC programs, ".LTR" for letters, etc. You can make up all the extensions you need. A few are reserved for the system (like ".COM") and others are used by applications programs.

If you do not specify a drive letter, the default drive is used. This is the drive identified in the system prompt:

```
A>  means "A" is the default drive.
B>  means "B" is the default drive.
```

You can change the default drive by typing the desired drive letter followed by a colon (you would type the "B:" in this example):

```
A>B:
B>
```

Now the system will assume drive B whenever a drive letter is not specified for a file.

All the CP/M commands outlined in the 128 manual follow certain file naming guidelines. The system also contains a standard ambiguous file naming system that allows you to specify a group of files that have something in common.

The asterisk is a wildcard. As the name implies, anything will match it. Suppose your disk contains the following files:

```
LETTER.TXT    BOB.TXT     BUDGET.CAL    MAIL.DAT
SPOOL.PRN     DEBI.TXT    MARY.TXT      MLPGM.ASM
SID.COM
```

If we type:

```
DIR *.TXT
```

the computer will respond with:

```
LETTER.TXT    BOB.TXT     DEBI.TXT      MARY.TXT
```

The asterisk can be used along with letters:

```
DIR M*.*
MAIL.DAT      MARY.TXT    MLPGM.ASM
```

Another wild card is the question mark. The asterisk matches items of any length. The question mark will match only one letter. In other words, *.* is the same as ????????.???. Here's an example using wild cards:

```
DIR *.?A?
BUDGET.CAL    MAIL.DAT
```

Only those files with an "A" in the second position of the extension are displayed.

Running Programs

The first programs you'll probably run are those found on the CP/M disk. You might spend hours trying to load programs in order to run them. If you're used to a Commodore, you'll see dozens of strange error messages if you try typing things like:

```
    LOAD "PROGRAM"
or  LOAD PROGRAM
or  LOAD PROGRAM.COM
or  EXECUTE PROGRAM
or  EXECUTE PROGRAM.COM
or  RUN PROGRAM.COM
or  ACCESS PROGRAM
```

None of these work. CP/M automatically loads and runs a program when you type its name. Your CP/M disk contains a program called "SID.COM". To run this program you need only type its name (excluding ".COM"):

```
SID
```

The "SID" program—a machine language debugging utility—will then load and run. To exit, type "q" and press RETURN.

If the program you want to run is not in machine language (or compiled), the proper language interpreter must be loaded first. A program written in BASIC will generally have an extension of ".BAS".

But you must first load a program such as *MBASIC*. You can do it all at once by typing:

```
MBASIC PROGRAM
```

where *PROGRAM* is the name of the BASIC program you wish to load. *MBASIC* will be loaded, then the BASIC program. The BASIC program will then run automatically. To exit *MBASIC*, type "SYSTEM".

The Bottom Line

CP/M is a little cranky, somewhat sluggish, and rather unforgiving. But it has endured the test of time. The CP/M world is very complete: Every imaginable program, gadget, and utility is available in one or more forms for CP/M.

Commodore's 128 version of CP/M conforms to all the CP/M standards if it's run with the 1571 disk drive. However, if you run this version with a 1541 disk drive, be sure to bring a lunch. This configuration is very, very slow. Even a simple directory listing is extraordinarily slow.

Speed is not the only factor. The 1541 cannot read the disks from other CP/M computers. Without this capability, CP/M is practically useless. But with the 1571 and a 128, all the speed and versatility of CP/M is available.

Directory Filer

Rodney L. Barnes

Reorganize your disk directories just as you like with this easy-to-use utility. It deletes, locks, and unlocks files, lets you move filenames where you wish, and insert dividers to group files together. For the Commodore 64, Plus/4, and 16.

How often have you searched the directory of a disk for a particular file, certain you have the right disk, yet unable to find that file? Or maybe you've had difficulty running a program because you don't recall which file is the "boot program." When a file is saved to disk, it's listed in the first available directory location, not always the location you might wish it to be. A file that has been scratched creates a gap which may become the next available location. After a while, finding a particular file can be difficult.

There have been several programs published lately which were designed to solve these problems. All of them have provided more convenience than the usual procedure of renaming and copying, but each has its disadvantages. Some of these programs alphabetize the directory so that you can find files more quickly. This is helpful (if you know the name of the file), but any files which are part of the same program may get separated. You can end up with the boot at one end of the directory and other program parts scattered throughout. The program still works, but what if you want to copy it to another disk? Which files make up which program?

Other solutions suggest saving a "dead" file (a filename of 16 hyphens) as a divider used to separate different types of programs or to set apart a program made up of several files. This practice uses up disk space. Although it uses only one block per divider, it still adds up.

Some may think that these disadvantages are not terribly significant considering that these solutions are quicker and more convenient than renaming and copying. But there's a better way.

"Directory Filer" came about as a solution to the problems just discussed and also as a way of accessing the undocumented ability to "lock" files against deletion. This program can also insert dividers into the directory without using disk space, and it automatically removes any gaps left by scratched programs. It lets you organize a directory by moving individual filenames around using the cursor controls.

Quick And Easy

Directory Filer is written for the Commodore 64 in BASIC (with a small machine language routine in the DATA statements beginning in line 1500). If you have a Plus/4 or Commodore 16, type in Program 1 and add the following lines:

```
KF 10 N$="ZZ":COLOR 0,1:COLOR
      {SPACE}4,1:NR=205:NC=202
      :KB=239:POKE806,115
FE 15 C=0:FORA=133TO136:FORB=0
      TO3STEP3:C=C+1:KEYC,CHR$
      (A+B):NEXTB,A
```

After typing in the program, save a copy. To use Directory Filer, load it and type RUN. You first see a request to insert the disk you wish to organize. (From this point on, you may abort the program at any time by pressing STOP.) After inserting the disk, press RETURN, as prompted, and the program will read in the directory. The next screen will display the disk name and the first 40 filenames, the first one of these highlighted by a blue bar.

Here's where the fun begins. By using the cursor keys you can move the cursor bar around the screen to any filename. Pressing HOME returns the cursor to the top of the left-hand column. If your disk holds more than 40 files, pressing N (for Next) or P (for Previous) displays the balance of the filenames.

To *lock* a file, press the less-than key (<). (A locked file cannot be scratched through normal methods.) You'll see a less-than sign appear to the right of the line with the filename. Press the same key on a locked file and it will be unlocked. To *delete* a file, press the space bar. An ARE YOU SURE? (Y/N) prompt appears. Press Y to delete the file, N to reconsider. *(Note: Use this command with some caution. Pressing the space bar will delete a filename whether it is locked or not.)* To insert a *divider* at any point in the directory, press the hyphen key (–).

To *move* a filename to another location, press RETURN and the selection will be stored in a buffer and the name displayed. Move the cursor to where you wish to insert the filename and press RETURN again. The selection will be moved from its original position and inserted *above* the filename highlighted by the cursor bar. A filename can be moved from screen to screen in the case where there are more than 40 filenames. Once the reorganization is complete, press f1 and the new directory will be written to disk. Then you can quit or reorganize another directory. Once you're through, listing the directory in normal fashion—*without* Directory Filer in memory—will show that it really is this easy.

See program listing on page 107.

WINDOWS On The 128

Jim Vaughan

Creating windows is fast and easy on the 128. This tutorial covers the basics—what windows are and how to use them. Also included is a program that allows you to save the text area beneath a window.

The Commodore 128 is a powerful and versatile machine. Besides having 128K of user memory, 80- or 40-column screen output, and a powerful BASIC (7.0), it also has a built-in Commodore 64 and full CP/M capability.

While new programs for the 128 mode are beginning to emerge, it's still mainly up to the owner to explore the new horizons opened by BASIC 7.0. One of the most fascinating new commands added to the BASIC language is WINDOW. Windows have become increasingly popular within the personal computer industry in the past few years. Some word processors now use "pull-down" menus for help while preserving your text on screen. Some windowing allows the running of two separate programs on the two halves of the screen.

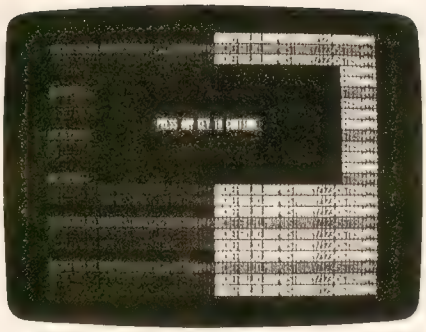
Creating Your First Window

A window is simply a section of the screen that you partition off for your exclusive use. When you're in a window, the computer acts as if that portion of the screen is all there is. A program listing, a disk directory, or even a running program will be displayed in just one section of the screen. In this way you can perform calculations or list programs in one section without disturbing the work you're doing elsewhere on the screen. The 128 offers two ways in which you can implement windows. Try this simple experiment. First type in this line in direct mode (no line number), and press RETURN:

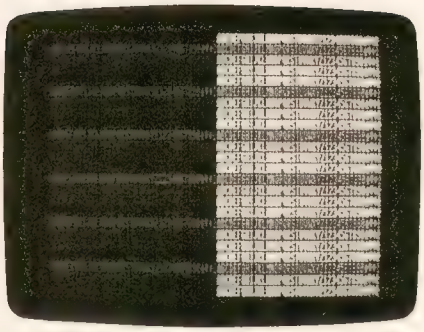
```
FOR I=1 TO 640:PRINT"*=";:NEXT
```

This fills your screen with a jumble of garbage, but it's sufficient to illustrate our example. Now, move the cursor to any point in the upper left part of the screen, press ESC and then T (ESC is the first gray key on the top row of the keyboard). Don't hold down the ESC key; press it once and release it, then press T. Now move the cursor to any point in the lower right side of the screen and press ESC and then B. You've just created your first window—but it doesn't look like much, right? Now, press SHIFT-CLR. *Voilà!* Type in a few commands (DIRECTORY, for example) and see how the window keeps the screen output within the borders that you give it. It's easy to remember the keys: ESC-T (T for Top) sets the top left corner of the window and ESC-B (Bottom) sets the bottom right corner.

This simple example illustrates the first method of windowing using direct mode. You can create a window anywhere on the screen with this technique. To restore your screen to its full format (80 × 25 or 40 × 25), just press the HOME key twice. This clears the window settings and resets your screen to normal. The direct method (ESC-T and



When you're finished with the window...



the text underneath is restored.

ESC-B) is useful for quick calculations or program debugging. For example, I often wish to do some simple calculations while debugging a program, but I want to see the program listing also. It's easy. I just move my cursor off to the side of the listing, use the above sequence to create a window in direct mode, and calculate. The listing doesn't scroll off the screen while I'm trying to do some sample calculations. You can also use the window in direct mode to test out a program line, to see its effect on the screen.

Adding Windows To A Program

Once you start playing with the above windowing technique, you'll no doubt think of many programming applications where windowing could be used. The ESCape key has an ASCII value of 27, so within a program you could position the cursor to the top left corner and then PRINT CHR$(27); "T" for the top of the window and then cursor down and right to PRINT CHR$(27); "B" for the bottom. But BASIC 7.0 provides an easier means to create a window: with the WINDOW command. This allows easy access to windowing from within your BASIC programs. The format for the command is:

WINDOW X1,Y1,X2,Y2,CLEAR

The variables X1 and Y1 are the screen coordinates of the upper left corner of the window, and the variables X2 and Y2 are the screen coordinates of the lower right corner of the window. CLEAR is an optional flag. If CLEAR is set to 1, it clears the window area after it's created, and if CLEAR is 0 (or omitted altogether), any text on the screen remains there. The X values for the WINDOW command must be between 0 and 79 for the 80-column screen. The Y values must be between 0 and 24.

Program 1 is a WINDOW Demo which will work either in 40- or 80-column mode. The program's purpose is to illustrate the use of windows in a program, but it also creates an interesting screen display while running. The program listing provides the basics for creating a general subroutine to handle windowing. Given four values (X1, Y1, X2, Y2), this routine will create the window, clear it of any text, and then create a border around the new window to set it off from the rest of the screen. It should be noted that this routine will create a window slightly larger than the one requested so that it can accommodate the border around the window.

Program 1 is fine if you don't care about the text (or graphics) that will be written over when the window is created. But what about that pull-down menu that comes down onto the screen of your word processor or database? Surely you don't want to lose any of that valuable data. The programming solution is to read in the data that lies beneath the window, save it in some buffer area, create the window, and then when you're done with it, restore the previous contents of the screen.

Your first instinct might be to go in and start PEEKing the appropriate screen locations and saving the data. This would work fine for the 40-column screen (memory locations between $0400 and $0800), but 80-column output is handled a bit differently. If you take a look at the abbreviated memory map in the back of your 128 System Guide, you'll note that there are no memory locations listed for the 80-column screen. This is because the 80-column screen is stored internally in a 16K memory area which is not directly accessible to the user, and therefore cannot be read or written to via any commands in BASIC.

Although the 80-column screen is not directly accessible, it can be PEEKed and POKEd in machine language. So to save part of the screen, we'll PEEK every character from the area under the window (screen memory is found in locations $0000–$0800 of the internal RAM of the 80-column chip) and save them to a buffer. It's also necessary to save attribute memory ($0800–$1000), which is the equivalent of 40-column color memory.

The Save Routines

Program 2 is designed to work with the 40-column screen, while Program 3 is for 80 columns. Both programs POKE a machine language program into memory at 8192. (Note that this is part of the hi-res screen area, so you must avoid graphics commands while using these programs.) To add the routines in your own programs, follow these steps:

1. Be sure to include the commands GRAPHIC1:GRAPHIC0 at the beginning of your program. This sets aside 9K of memory for the hi-res screen, memory which will actually be used by the ML routine.

2. After the routine has been POKEd into memory, you can save the contents of a window with SYS 8192. This SYS must come *after* you've used the WINDOW command. You can then clear the window and print the menu (or whatever you wish to place in the window).

3. To recall the previous contents of the window, insert a SYS 8195.

The two programs create a sample screen, put a window there, and then wait for a keypress. The screen underneath the window is then restored.

See program listings on page 108.

BASIC magic

Numeric Variables In READ And DATA Statements

Michael S. Tomczyk

Michael S. Tomczyk is a former Commodore marketing executive and product designer. His recent book, The Home Computer Wars, *describes the rise of Commodore and is published by* COMPUTE! Books.

Last month, we presented a beginner's introduction to READ and DATA statements, and saw how to use string information (words, phrases, etc.) in DATA statements. This month, we'll see how to use numeric information in READ and DATA statements and offer some interesting tips as well. But first, in case you missed last month's column, here's a quick refresher of how the DATA statement works.

DATA is used to contain lists of string or numeric information you want to use in your program. Programmers generally group together DATA lines at the very beginning or very end of a BASIC program. If you continue your DATA list on different lines, you must always put the DATA command at the beginning of each line.

The READ command is used to extract DATA from the list. READ extracts one item at a time from the DATA list. After you READ one item, you can manipulate it—for example, by printing a word or using a number in calculations.

End-Of-Data Flags

In our previous column we looked at some basic formats for using READ and DATA statements, demonstrated in this example:

```
10 DATA CATS,DOGS,MICE
100 PRINT CHR$(147)
200 READ W$:PRINT W$:GOTO 200
```

Line 10 contains three words in a DATA statement. Line 100 clears the screen.

In line 200, READ W$ tells the computer to READ the *first* item from the DATA list in line 10. PRINT W$ tells the computer to print the item on your screen. The word "CATS" is displayed.

The GOTO command at the end of line 200 makes the computer go back to the same line and READ from the DATA list again. So the second time, the computer reads and prints the second word (DOGS), and the third time it reads and prints the third word (MICE)—but the *fourth* time it goes back to read more DATA, there's no more to be read. When the computer runs out of DATA to read, it displays an error message: OUT OF DATA ERROR IN 200.

To eliminate this error, we can use a "flag" or "marker" at the end of the DATA list which can be used to tell the computer to GOTO another line in the program, continue the rest of the program, or RESTORE the list so it can be used again (more on RESTORE below).

```
10 DATA CATS,DOGS,MICE,END
100 PRINT CHR$(147)
200 READ W$
300 IF W$="END" THEN GOTO 400
350 PRINT W$:GOTO 200
400 PRINT"CONTINUE PROGRAM
    HERE."
```

This program is exactly the same as our previous program, except we've separated the READ and PRINT commands in lines 200 and 350, so we could include the IF-THEN statement in line 300.

The IF-THEN statement is placed between the READ and PRINT portions of the program so that immediately after reading the DATA in line 200, the computer checks to see if what it just read is the word "END". IF the item in the DATA statement is the word END, the computer is instructed to GOTO line 400—where you would normally continue the rest of your BASIC program.

This "flag" can be a number, word, or letter—anything the computer can check for in an IF-THEN statement.

Note that you need the flag only if you use the GOTO or GOSUB command to read the DATA. If you use a FOR-NEXT loop, the program or subroutine will automatically end when the loop is completed. For instance, we don't need an end-of-data flag in the previous example if we use a FOR-NEXT loop, like this:

```
10 DATA CATS,DOGS,MICE
100 PRINT CHR$(147)
200 FOR X=1 TO 3:READ W$
300 PRINT W$:NEXT
```

Reading Numeric DATA

So far, we've looked at how to handle string information as DATA. Now let's see how *numeric data* or *numbers* are handled.

To begin with, numbers used in calculations are handled just like string DATA, except instead of reading a string variable like W$ or T4$, you must use a *numeric variable* like W or T4 to define the numbers in the DATA list.

Numbers can be held in a DATA list and extracted for use in calculations, as in this example:

```
10 DATA 10,20,30
100 PRINT CHR$(147)
200 FOR X=1 TO 3:READ N
300 PRINT"NINE TIMES"N"
    EQUALS"9*N
400 NEXT
```

Line 10 contains our DATA—in this case, the numbers 10, 20, and 30. Line 100 clears the screen.

Line 200 contains a FOR-NEXT loop, which in this case is used to repeat an action in your program three times. The first action is READ N, so the computer reads the number 10 from the DATA list. It still hasn't done anything with the number yet, except define the variable N as the number 10. Now, wherever you see N in the rest of the program, it will be the same as 10.

Line 300 is a PRINT statement which uses one PRINT command to do several things on one program line. We begin by PRINTing the first part of a sentence, inside quo-

tation marks, then we go outside quotation marks to print the number represented by N, then back inside quotation marks to print the rest of the sentence; and finally, outside again to perform a calculation, which multiplies 9 times the number represented by N. The first calculation will be 9 times 10.

As we've explained, the process will be repeated three times because of the FOR-NEXT loop, so the computer cycles back and redefines N as a new number from the DATA list—first as 20, then as 30—and substitutes the new number N in the PRINT statement.

REM: *The FOR-NEXT command is used to repeat actions or commands in your BASIC program. Everything between the FOR and NEXT portions of the command will be repeated the numbers of times specified. For example, if you wanted to PRINT the word "HELLO" three times, you could type this line and press RETURN:*

```
FOR X=1 TO 3:PRINT"HELLO":NEXT
```

You can also use the numbers in the FOR-NEXT counting sequence, like this:

```
FOR X=1 TO 3:PRINT X:NEXT
```

And here's a slightly more complicated example:

```
FOR X=1 TO 3:PRINT X"TIMES 5
  EQUALS"X*5:NEXT
```

You can read more than one item at a time from the DATA list by using different variables. Each variable will read the next item from the DATA list in order. Here's a short program to demonstrate this technique:

```
10 DATA 10,20,30
100 READ A,B,C
200 PRINT"A="A:PRINT"B="
    B:PRINT"C="C
```

Line 100 reads three numeric variables, A, B, and C. When you use those variables in the PRINT statement in line 200, you can see what the values are.

Selecting DATA Items Out Of Sequence

As we've already indicated, items in a DATA list are always read in sequence by the computer. However, there is a way to read the items in a different sequence: by using a FOR-NEXT loop.

Try this example:

```
10 DATA PIGEONS,PARROTS,
   SPARROWS, DUCKS
100 PRINT CHR$(147)
200 FOR X=1 TO 4:READ W$:NEXT
300 PRINT W$
```

This program wraps the READ W$ command inside a FOR-NEXT loop, which tells the computer to repeat the READ process four times. Remember, the computer can read DATA without printing it. So the computer reads the first item in the DATA, which is PIGEONS, then it loops back and READs the second DATA item, PARROTS, and so on. The FOR-NEXT loop makes the computer read four items. At this point, W$ equals "DUCKS" because the READ variable (W$) equals the last item. That's why, when we PRINT W$ in line 300, it's the same as printing "DUCKS."

To PRINT "PARROTS," simply change the number 4 to 2 in line 200—this makes the computer read two items from the DATA, and the item which is printed in line 300 will be the second item.

The RESTORE Command

Sometimes, after going through a DATA list, you'll want to go back and repeat the sequence more than once in the same program. You need to tell the computer to go back to the beginning of the list. For this, you need the RESTORE command. Try this example:

```
10 DATA SUN,RAIN,SNOW
100 FOR X=1 TO 3:READ M$:PRINT
    M$:NEXT
200 READ M$:PRINT"OF THESE
    THREE,"
300 PRINT"I PREFER "M$
```

When you run this program, you get an OUT OF DATA ERROR IN 200. That's because the computer has used up all three items in the DATA list in line 10. To use the DATA over again, we must use the RESTORE command. This command tells the computer to go back to the beginning of the DATA list and start over. It's used whenever you want to repeat a DATA sequence. Change line 100 to the following, then run the program again:

```
100 FOR X=1 TO 3:READ M$:PRINT
    M$:NEXT:RESTORE
```

Now line 200 will execute properly.

Reading DATA Out Of Sequence

The RESTORE command can also be used to read a DATA list backwards. Try this example:

```
10 DATA CATS,LIKE,DOGS
100 PRINT CHR$(147)
200 FOR X=1 TO 3:READ W$:PRINT
    W$:NEXT
```

This simple program reads and prints the DATA in line 10. The FOR-NEXT loop in line 200 causes the computer to repeat the process three times. Notice that the DATA appears in the same order it appears in the list. That's because DATA is always read in sequence. Now try this variation:

```
10 DATA CATS,LIKE,DOGS
100 PRINT CHR$(147):L=3
200 FOR X=1 TO 3:FOR W=1 TO
    L:READ W$:NEXT:PRINT
    W$:RESTORE:L=L-1:NEXT
```

Line 100 contains a new element. We define the variable L as the number 3. We'll use this in line 200.

Line 200 contains two FOR-NEXT loops. The first one causes the entire line to repeat three times. The second loop tells the computer to count through from 1 to the value of L and READ from the DATA list. On the first loop, the value of L is 3 (from line 100), so the computer reads from 1 to 3 and the last item read is the third item in the DATA list. This means W$ equals the word DOGS.

Then we RESTORE the DATA list so the computer starts over from the beginning of the list the next time it reads DATA. At this point, the variable L equals 3, but we want to change it to 2, so we do this by subtracting 1 from L—so now L equals 2. The NEXT command repeats the loop.

On the next cycle, when the computer reaches "FOR W=1 TO L," the value of L is 2, so it READs to the second item in the DATA, which is the word "LIKES." We print the word LIKES, then change the value of L to 1.

On the third cycle, the value of L is 1, so the computer reads to the first item in the list, which is CATS. The result is that the DATA is printed backwards and displayed: DOGS LIKE CATS.

Dice And Double PEEKs

Thomas W. Wallis

If you've discovered a clever time-saving technique or a brief but effective programming shortcut, send it to "Hints & Tips," c/o COMPUTE!'s GAZETTE. *If we use it, we'll pay you $35. Due to the volume of items submitted, we regret that we cannot always reply individually to submissions.*

When you're writing a game in BASIC and need a random number between 1 and 10, you would use a line that looks something like this: **N=INT(RND(1)*10+1)**. The random number function RND generates a fractional number between 0 and 1. Multiplying by ten yields a number in the range 0 to 9.9999999. Adding 1 and performing an INT makes it into an integer between 1 and 10. It's like rolling ten-sided dice.

A General Function For Rolling Dice

Variations of the formula above might be found in many places within a long program. But its 18 characters take some time to type, especially if you're a hunt-and-peck typist. There's an easier way to get random numbers: just define a function at the beginning of your program and then use the function in place of the formula. The following program simulates the rolling of two six-sided dice:

```
10 DEFFNR(X)=INT(RND(1)*X+1)
20 D=FNR(6)+FNR(6):PRINTD
30 GETA$:IFA$=""THEN30
40 GOTO20
```

The function FNR defined in line 10 picks at random a whole number between 1 and X. Once that's been done, you can substitute FNR(X) for INT(RND(1)*X+1). Note that it's not necessary to use the variable X when you later call FNR, the X is just a marker in the DEF statement that defines the function. Line 20 rolls the dice twice, generating two numbers in the range 1–6, and then adds them together. Line 30 then waits for a keypress, after which the program loops back to line 20 to roll the dice again.

Compare the relatively short formula **D=FNR(6)+FNR(6)** to the longer alternative **D=INT(RND(1)*6+1)+INT(RND(1)*6+1)**. It's not only easier to read the FNR(6) version, it also uses up less memory and takes less typing.

This random integer function can be used in a variety of ways. It could be helpful in making up math problems for a children's educational program. It could be part of an ON-GOTO branch (ON FNR(3) GOTO 100,210,300) to make random choices in an adventure game. It's very useful when you're simulating percentage calculations in a strategy game; perhaps a baseball player has a 31 percent chance of getting a hit, so if FNR(100) is less than 32, the player would be credited with a hit. And if you're creating a word puzzle, you can pick random letters with CHR$(FNR(26)+64).

Double PEEKs

Defined functions can contain any mathematical or logical operation, but they can also contain any of the various BASIC functions which return a value. PEEK, for example, tells you what number a certain memory location contains. Many locations use two-byte pointers in low-byte/high-byte format. To convert to a decimal number, you have to multiply the high byte by 256 and add the low byte, just the sort of thing a defined function can do well.

```
10 DEFFND(X)=PEEK(X)+256*PEEK(
   X+1)
20 FORJ=43TO55STEP2:PRINTJ,FND
   (J):NEXT
```

Here, we've defined a double PEEK function called FND. Line 20 uses FND to examine the pointers that indicate where BASIC programs and variables are stored. In certain programs it's important to know the values held by these pointers and FND simplifies the calculation.

You can also invent a function to break a number into its low byte and high byte. At the beginning of the program, include **DEF FNH(X)=INT(X/256)** and **DEF FNL(X)=X AND 255**. If you need to change a pointer, you can use FNL and FNH to determine the low byte and high byte.

Anytime you find yourself using a certain mathematical routine over and over, you may discover it's a good idea to rewrite it as a function. It's possible to nest them, to have one function call another, so you're not limited by the maximum line length of 80 characters (on a 64, Plus/4, or 16), 88 (on a VIC), or 160 (on a 128). Defined functions are something like portable subroutines which are quite handy and flexible in a wide variety of programming situations.

COMPUTE!'s Gazette is looking for utilities, games, applications educational programs, and tutorial articles. If you've created a program that you think other readers might enjoy or find useful, send it, on tape or disk to:

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simple answers to common questions

Tom R. Halfhill, Staff Editor

Each month, COMPUTE!'s GAZETTE *tackles some questions commonly asked by Commodore users. If you have a question you'd like to see answered here, send it to this column, c/o* COMPUTE!'s GAZETTE, *P.O. Box 5406, Greensboro, NC 27403.*

Q. I currently own a Commodore 64 and a Sanyo color monitor with composite video and RGB inputs. I am considering upgrading my system to the Commodore 128. Can the RGBI output of the 128 be fed into my monitor? If so, what kind of cable do I need? The RGBI output of the 128 has nine pins and my monitor's RGB input has only eight pins.

A. Yes, the RGBI output of the Commodore 128 will work with your Sanyo or any other monitor that has an RGBI or digital RGB input.

RGB stands for Red-Green-Blue, the colors produced by the three electron guns inside color TV sets and monitors. All of the colors you see on the screen are made up from these three primary colors. By driving these electron guns directly, computers with RGB capability produce much sharper text and graphics than computers with composite outputs only. (For maximum flexibility, the Commodore 128 also has a composite output for non-RGB monitors and an RF output for TV sets.)

There are two general types of RGB monitors: *digital RGB* and *analog RGB*. RGBI is a type of digital RGB that stands for Red-Green-Blue-Intensity. The intensity signal controls the brightness of the red, green, and blue colors on the screen. RGBI monitors can produce eight unique colors with two levels of intensity, for a total of 16 colors. Computers with RGBI outputs include the Commodore 128, IBM PCjr, IBM PC and XT (with color/graphics adapter), most IBM compatibles, and the Apple IIc and IIe.

Analog RGB, however, is not limited to 16 colors. That's why the Amiga, which can produce 4,096 colors, and the Atari ST-series computers, which can produce 512 colors, use analog RGB monitors instead of digital RGB/RGBI. (For flexibility, the Amiga also has digital RGB and composite outputs, and late-model STs have TV outputs.)

To use a digital RGB monitor with the RGBI output of a Commodore 128, simply plug in a standard IBM RGB monitor cable—the connectors are fully compatible. The reason why the 128's RGBI jack has nine pins instead of eight is that there's an extra pin which allows you to hook up a monochrome composite monitor. Since green- and amber-screen monochrome monitors are available for around $100 or less, this is an economical way to obtain sharp 80-column text if you don't want to buy an RGB monitor. Inexpensive adapter cables are available for connecting standard monochrome monitors to the 128.

The Commodore 1902 monitor designed especially for the 128 has three types of inputs: composite video, separated chroma/luma video, and RGBI. The Amiga monitor also works well with the 128 (see "Simple Answers To Common Questions," February 1986).

Q. In the December 1985 issue you addressed the question of getting 80-column resolution from the Commodore 64 using a plug-in board. It must also be possible to obtain a direct-drive RGB-type interface for the 64 by enhancing or replacing the existing composite video output circuitry. This arrangement would allow optimal monitor resolution for the 64. Do you know of any commercially available units of this type, or can you suggest a do-it-yourself procedure?

A. You're right—it is possible to modify or replace the Commodore 64's composite video circuitry to provide an RGB output. Such boards are available for other computers, such as the Apple II and Atari 800. However, we're not aware of a similar accessory for the 64. This might simply be because RGB monitors were too expensive for the home market until recently. Perhaps some company will introduce an RGB adapter for the 64 in the near future, or maybe a reader knows of such a product that's already available. The do-it-yourself approach, unfortunately, would require a considerable amount of technical skill and is beyond the scope of this column.

Q. I've heard of products that speed up the 1541 disk drive. Is this good for the drive motor?

A. These products don't actually speed up the disk drive's *motor*—just the disk drive's rate of input and output. Some of them don't even modify the hardware at all; they work entirely in software. An example is "TurboDisk," published in COMPUTE!'s GAZETTE, July 1985. It's simply a program that makes disk access more efficient. Other 1541 accelerators available commercially do require slight modifications to the drive, but none of them hurts the drive or increases wear in any way. In fact, if anything, they'll extend the life of a drive, since they keep the machine from working as hard.

computing for families

The Steven Spielberg Of The 21st Century

Fred D'Ignazio
Associate Editor

When I was a child, I dreamed of growing up and becoming a filmmaker. I wanted to tell stories like my hero, Walt Disney, whose work appeared weekly in movie theaters and on TV. My parents bought me a movie camera, and I went off into the woods, the local alleys and railroad yards, and the school playground and filmed classics like "The Tree Stump from Outer Space," "The Three-legged Dog," and "The Sixth Grade Bully." When the World's Fair came to New York in 1964, I was there with my camera taking artistic shots of gaudy, high-tech trashcans, milk cartons floating in water fountains, and futuristic light bulbs.

Also as a child I had a desire to be like my heroes Bach and Beethoven and compose great music. And I wanted to paint and be a cartoonist, and maybe someday land a spot as an illustrator at *Mad* magazine.

Sadly, I never realized any of these dreams. Somewhere along the line, as I grew up, I realized I didn't have the multitude of talents I craved—in film, drawing and painting, or music. Yet I still had a passionate desire to communicate in some medium. So I settled for a career as a writer. I could still communicate, but I limited my communication to printed words.

For years, my choice seemed very reasonable. Becoming a composer, filmmaker, or artist requires great talent and years of intense effort and dedication. Also, the tools of the communication media are in the hands of a very few: the superstars and media moguls in movies, television, and the recording industry. Doing anything significant in these media requires an enormous investment in money, equipment, and expertise. I, of course, had none of these.

Now, taking a look at the new developments in consumer electronics, I'm wondering if it's time for me to begin dreaming again. New computers, video cameras, electronic synthesizers, and electronic digitizers may make it possible for me to communicate like my old hero Walt Disney, and not have to limit myself to the printed word.

Personal communication tools are popping up all over. And people who, like me, have to communicate or want to communicate are gobbling them up. For example, witness the phenomenal success of Brøderbund's *Print Shop* program, which enables people to create their own signs, newsletters, banners, and cards. At the Christmas program at my children's elementary school, I saw an entire school decorated with *Print Shop*.

Print Shop is just the tip of the communications iceberg. Other computer programs like Springboard's *Newsroom* and Aldus's *PageMaker* let people create their own professional printed page layouts like you see in newspapers and magazines. You can communicate with pictures you've drawn or digitized video images, and mix them with words you've written—words of all sizes and shapes laid out graphically on the page. Collectively these programs are known as "personal publishing."

The word "personal" is becoming the keyword in other areas of electronic communication, too, including music, computer graphics and animation, and video.

In each area, programs are appearing which enable communicators to create media productions without an enormous investment in money, experience, and training, and without significant artistic ability. Programs like Brøderbund's *Fantavision*, MacroMind's *VideoWorks*, and Electronic Arts' *Video Construction Set* will help us frustrated cartoonists generate sophisticated animations. We can turn to Electronic Art's *Deluxe Music Construction Set* and a host of other music composition tools to create music scores for our video presentations. We can use digitizing tools like Koala Technologies' *MacVision* to transfer video images to the computer screen, and we can film it all with the new lightweight camcorders and video cameras.

Then all we'll need is for some genius to create a universal "personal studio" package that integrates all these media—for home, business, and school use.

The marvelous result is that we communicators (teachers, students, business people, librarians, churchgoers, parents, etc.) no longer have to be the passive recipients of electronic media. We can stop consuming media and start creating it! Furthermore, we can stop limiting ourselves to communicating along narrow channels, with only the spoken or written word. Now we can put together personal communication studios where we create our own messages in the medium or media of our choice. The medium can suit the message, since our options will, for the first time, be wide open.

The other day, as I looked at my own studio and its growing array of computers, electronic keyboards, and video cameras, I grew excited and exclaimed to my wife, "I want to become the Steven Spielberg of the twenty-first century!" My wife is accustomed to my passions and enthusiasms, and knows not to be overwhelmed when I scream and point, and jump up and down. "What's really exciting," she said wisely, "is that if you're right, we may all be Steven Spielbergs by the twenty-first century."

Input Windows

Thorpe Thompson

This machine language routine can give your Commodore 64 BASIC programs a highly professional look. It adds screen windowing capability—you can choose the window size—for user input.

When programming, it's important to maintain tight control over input. You can use the INPUT statement, but it's often susceptible to unwanted results. "Input Windows," a machine language utility in the form of a BASIC program, functions just like an INPUT statement, but gives you more control over the process by creating a window for inputting a response from a user. The window, which can be easily positioned anywhere on the screen, defines the size of the input field and the active area of the editing keys (CRSR right/left and INST/DEL). When the RETURN key is pressed, the input data is placed in T$ or T1, depending on whether you require string or numeric data from the user.

Using The Routine

Type in and save Program 1. Type the DATA statements carefully—one incorrect digit can make a big difference in machine language. The program keeps track of a checksum value, so it will not write an executable file to the disk unless all the data items are correct. When you have a good file, you can load it into your BASIC program with the following line:

```
5 IF A=0 THEN A=1: LOAD "INPUT
  .OBJ",8,1
```

If you're using tape, change the 8 to a 1. Next, you need to add this subroutine to your program:

```
10000 POKE 142,LNG: POKE 143,TYP
10010 SYS49152: IF (1 AND ST) THEN
      T$=" ": T1=0
10020 RETURN
```

You set LNG to the field size (in characters) and TYP to the data type (0=string/1=numeric) prior to calling the subroutine.

The left edge of the input window will be placed at the current cursor position—you can position the window with PRINT statements. For example, if you wanted the window to start at the fifth row from the top, and the tenth column you could use this line:

```
100 PRINT "{HOME}{5 DOWN}
    {10 RIGHT}";
```

Don't forget to put a semicolon on the end of the line or the window will be placed one row below the one you want.

Suppose you want the window to start next to a screen prompt. Since the position is determined by the current cursor position, you can use the prompt PRINT statement to position the window like this:

```
100 PRINT "ENTER YOUR NAME- ";
```

Here, again, the semicolon must not be forgotten. The trailing space on the screen prompt separates the window from the prompt.

Use the parameters LNG and TYP to control the input data. LNG is set to the maximum size of the input field in characters. If you wanted to input a string of ten characters in length, you would set LNG to 10 before calling the subroutine. (The data need not be ten characters in length, but it can be no greater than ten.) You must also set TYP to the type of data to be input. If TYP=0, then the machine language routine treats the data as string input. A TYP of 1 causes the data to be treated as numeric input.

Let's set up the code to input a name with a maximum length of 20 characters:

```
100 PRINT "ENTER YOUR NAME- ";
110 LNG=20:TYP=0:GOSUB 10000
```

After returning from the GOSUB call, the data will be in the variable T$. You must transfer the value to another variable before calling the subroutine again or the data will be lost. As an example of numeric input, this code could be used to input a dollars and cents amount in the range of $0.00 to $99.99:

```
100 PRINT "ENTER THE PRICE-$";
110 LNG=5:TYP=1:GOSUB 10000
```

This time you have to set TYP to one. Note also that LNG was set to five. This is necessary because the decimal point counts as one character in the field size. It's possible to enter an amount as large as $99999 by omitting the decimal point, so you have to check the data after the GOSUB call to ensure that it's valid data.

A Demonstration

To see how Input Windows works, type in "Demo" (Program 2) and save a copy. Change the 8 in line 100 to a 1 if you're using tape. Be sure Program 1 is on the disk (or immediately following Program 2 if you're using tape). Load Demo and type RUN. It will automatically load the machine language file created by Program 1 into memory.

How The Routine Works

When the BASIC subroutine at line 210 is called, the values of LNG and TYP are stored in zero page for access by the machine language routine. Next the SYS statement causes the program to execute the machine language code at 49152 ($C000). The machine language waits for a key to be pressed. When it reads a key, it first checks it against a table of values to see if it needs to execute a function, (such as INSerT, CRSR right, and so on). If the keypress is not a function, the value is tested to ensure it's in the range of printable characters. If the key is out of range, the routine goes back to fetch another keypress. If the value is within range, the routine displays the keypress on the screen and stores

the ASCII value of the key in the input buffer. This process continues until the RETURN key is pressed.

Now the routine transfers the data to a special buffer and sets up a "fake" BASIC line in high memory. The CHRGET routine is vectored to point to the pseudo-BASIC statement and the LET routine in BASIC ROM is executed equating the variable with the input data. Finally, the CHRGET routine is revectored to its original address in the BASIC program and the program returns from the SYS.

Execution continues with the IF statement. If no data was entered before the RETURN key was pressed, the status variable (ST) will be set to 1. Otherwise, ST will have a value of 0. If ST is set to 1, both variables are cleared and the program returns from the GOSUB call empty-handed. When the condition is false, the proper variable will hold the input data.

Wrapping It Up

This routine behaves differently depending on which character set you're using. When set one is in use, the routine accepts numbers, punctuation characters, and uppercase letters as valid characters. This prevents the user from entering graphics characters as input data. If set two is being used, the valid characters are numbers, punctuation characters, and upper- or lowercase letters. The field size can be from 1 to 75 characters. Characters which would be interpreted as delimiters by the INPUT statement (such as commas) are accepted as valid data in the string input mode. The sign characters, negative and positive, are accepted as valid data in numeric input mode. CRSR up/down and CLR/HOME are not active during either input mode.

You can use the routine with any screen unless it's located under BASIC or Kernal ROM. The screen address is figured by the routine each time it is called so you can switch screens in your program without any problem. Using this controlled input routine you can prevent unwanted results from occurring at input points and make your programs less reliant on the user "playing by the rules."

See program listings on page 109.

machine language for beginners

Cracking The Kernal

Richard Mansfield
Senior Editor

Cracking The Kernal

Last month we discussed some of the uses of a map of your computer's interior landscape. Another reason to learn about and use ROM maps is that you can then transport your 64 or VIC ML programs to a new model. If you've bought a 128, you'll probably want to translate some of your valuable 64 software so it can take advantage of the extra features of the 128.

Fortunately, Commodore has made this job somewhat easier than it might have been: A number of the most commonly used ROM routines have been arranged into a *jump table*, often called the Kernal. Commodore thoughtfully clustered the addresses of many popular subroutines together and froze them. So any Commodore computer (except the Amiga)—even the original PET machines from 1979—will respond correctly when you, for example, JSR $FFD2. That's the most famous of the Kernal routines and one of the most often used. It sends whatever character you've put into the accumulator to the currently active peripheral. The default peripheral is the screen, so $FFD2 is usually called "PRINT", although this same routine will send the character to a disk or cassette or printer if a channel has been opened to one of those devices. Let's explore how to use the Kernal.

$FFBA SETLFS: set up the 1,8,0 in OPEN "NAME",1,8,0
$FFBD SETNAM: set up the "NAME" in OPEN "NAME",1,8,0
$FFC0 OPEN: open a file
$FFC3 CLOSE: close a file
$FFC6 CHKIN: create an input channel using the file number of a previously opened file
$FFC9 CHKOUT: create an output channel
$FFCC CLRCHN: restore default (keyboard for input; screen for output)
$FFCF CHRIN: bring in one character from device; leave in accumulator
$FFD2 PRINT: send out one character from accumulator to current device
$FFD5 LOAD: load an entire file from tape or disk
$FFD8 SAVE: save an entire file to tape or disk
$FFE1 STOP: test the STOP key
$FFE4 GETIN: like CHRIN except doesn't wait for input

JMP Off Points

The most complex job in ML is communicating with the world outside the computer, often called I/O for Input/Output. This communication involves precise timing, data management, and signalling. Few ML programmers write the lengthy and complicated code required to store or fetch information to or from the screen, keyboard, printer, disk, or tape drive. Instead, they rely on

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the built-in ROM routines which perform these services for BASIC and can be accessed via JSR from within a machine language program.

Commodore has standardized these I/O routines into the Kernal jump table. Kernal routines are quite useful and, because they're frozen into the same addresses in ROM, you won't need to modify most JSRs to them when transporting a program between a VIC or 64 and the new 128. The Commodore Kernal table resides between addresses $FF81–FFF5 and there are a total of 39 jump-off points to which you can JSR within this table.

You JSR to the Kernal table as if it contained subroutines, but the items in the table take up only three bytes. Clearly they're not normal subroutines. Instead, they are JMP NNNN instructions where the NNNN is the actual address of the subroutine in a particular model's ROM. The NNNN for the VIC STOP key test subroutine will differ from the address for the 64 which, in turn, is different from the 128s. But, because each machine will test its STOP key if you JSR $FFE1, this frozen ROM table somewhat simplifies the modification to make programs run on new models. And, because you JSR to a place that simply performs a JMP, your return address is still active. So when the real subroutine is finished with an RTS, you'll be returned to your ML program in the normal fashion, as if you'd returned from a direct call to an ordinary subroutine. To the programmer, a JSR into a jump table is indistinguishable from any other subroutine call.

There are high-level and low-level Kernal routines. Again, most programmers stick with the high-level routines because they are less complex and require less programming. The most commonly used Kernal addresses, followed by their name and a description are listed in the table on the previous page.

These routines work together. You cannot just JSR $FFD5 and expect to load in a program from the disk drive. The computer must first know that you want to access the disk, not the tape drive, and it must know the name of the file you're after. And because it has additional features, the 128 adds some new subroutines to the Kernal. Of particular importance is SETBANK at $FF68, which establishes the Bank where the filename is to be found and the Bank in which a fetched or stored character or file will be located.

When you are accessing data files (vs. programs) you need to do more than just SETLFS, SETNAM, (and SETBANK). You must first OPEN the file and leave it open. Then, to get a character from it, you .LDX #FILENUMBER:JSR CHKIN: JSR CHRIN:JSR CLRCHN. You can get the next character in the file by repeating this process. The computer will keep track of the location in the file from where you last fetched a character. When you are through looking at data in this file, you LDA #FILENUMBER:JSR CLOSE. Storing via PRINT is similarly accomplished with a CHKOUT prior to each JSR PRINT.

Here's a complete example which loads in a program named "TEST" from the disk drive:

```
10 *= $B00
20 SETNAM = $FFBD
30 SETBANK = $FF68
40 SETLFS = $FFBA
50 LOAD = $FFD5
60;-----------------------------------------
100 LDA #4; put the length of the filename into the accumulator
110 LDX #<NAME:LDY #>NAME; put LSB/MSB of name address into X/Y
120 JSR SETNAM
130 LDA #0:TAX:JSR SETBANK; omit this unless you use a 128. (A indicates which
                            Bank the program will be sent to. X indicates in
                            which Bank the filename is located.)
140 LDA #0:LDX #8:LDY #$FF; prepare secondary addresses
150 JSR SETLFS
160 LDA #0; shows that this is LOAD. Anything else in A causes a VERIFY.
170 JSR LOAD
180;-----------------------------------------
190 NAME .BYTE "TEST"; name of file to be LOADed.
```

All programs listed in this magazine are available on the GAZETTE Disk. See details elsewhere in this issue for details.

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• The character sets from "Construction Set" (December 1985) load properly from disk files, but readers will have problems loading from tape because of the way the original "MLX" program saves files to tape as absolute, non-relocatable files. To fix the files, follow these instructions: Enter **POKE55,0: POKE56,64: CLR** and then load MLX. List line 763 and change **POKE782,1** to **POKE782,0**. Run it, load the character set from tape (with SHIFT-L), and save (SHIFT-S) to a new tape. The new file should work correctly.

• Several readers wrote to say that while "List Pager" (December) does skip over perforations, the header function doesn't work at all, printing "CBMBASIC0" and several graphics characters instead of the proper header. If this happens to you, it's a good indication that you didn't completely follow the instructions in the article. Before running the program the first time, you must type **POKE 56,PEEK(56)−1: CLR**. This lowers the top of memory by 256 bytes to make room for the header message.

• "Disk Disassembler" (January 1986) contains several bugs. Lines 2330 and 2360 should, of course, have DATA inserted at the beginning of each line. Also, the program incorrectly disassembles the ADC absolute,X instruction as well as any instruction using the indirect indexed addressing mode, as in LDA ($02,X). And if you disassemble from disk, the last byte of the file is omitted. To correct the program, delete lines 1120 and 1130 and enter these lines:

```
1095 IFTS<>0ANDDI=1THENGOSUB
  1970:CLOSE1:CLOSE2:CLOSE4
  :CLOSE15:END
1096 IFTS<>0THENCLOSE1:CLOSE2:
  CLOSE4:CLOSE15:END
1110 NU$=NU$+STR$(CD):TS=ST
1360 Q$=Q$+" ("+Z$
1380 IFD$="Y"THENQ$=Q$+"),Y"
  :GOTO1030
1390 IFD$="X"THENQ$=Q$+",X)"
  :GOTO1030
2100 DATAADC#,105,2,ADC00,101,2,
  ADC0X,117,2,ADCAB,109,3,
  ADCAX,125, 3,ADCAY,121,3
2330 DATASBCIX,225,2
2360 DATASTX00,134,2
```

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news & products

Graphics Package

A library of 111 ready-made graphics for the Commodore 64 has been released from Unison World, Inc. Called *PrintMaster*, the program includes 11 background patterns, eight type fonts in a range of sizes, outline and 3-D effects, a graphics editor, a text editor, and a Design Archive with which to save designs. There is also a preview mode, for viewing designs before they're printed.

Printers supported by the program are the C. Itoh Prowriter 8510 and Prowriter Jr.; Commodore VIC-1525 and MPS-801; Epson FX, RX, and MX with Graftrax; Okidata 82A with Okigraph 1, Okidata 83A with Okigraph 1, 192, and Okimate 10; Star Gemini 10X, and 15X.

Suggested retail price for *PrintMaster* is $34.95.

Unison World Inc., 2150 Shattuck Ave., Suite 902, Berkeley, CA 94704.

Circle Reader Service Number 200.

Flexidraw Expands

Inkwell Systems has developed version 5.0 of the Flexidraw Light Pen Graphics System for the Commodore 64. The new version features greater sensitivity to monochrome monitors, particularly those with amber illumination. Like the original Flexidraw system, the updated package includes a light pen and graphics software with shapes, fonts, and drawing enhancements. Suggested retail price is $149.95. Those with earlier versions of the Flexidraw System may get the new software upgrade for $12.95 plus $2.50 shipping and handling.

Also new from Inkwell is the *Flexifont* graphics program, a font and character generating package for use with the Flexidraw Light Pen and the Commodore 64. The program includes 33 letter styles, custom lettering capability, and editing features including copy, paste, flip, rotation, and four-directional movement. Created symbols and fonts can be saved to disk for later use. *Flexifont* lists for $29.95.

Users of *Flexidraw* can now convert pictures from *Koala, Doodle*, and *CadPak 64* and text from the *Paperclip* word processor onto the Commodore 64 with Inkwell's *Graphics Integrator*. Conversions can be made from hi-res to hi-res, hi-res to *Flexidraw*, and multicolor to hi-res. Unlike *Flexidraw* and *Flexifont*, *Graphics Integrator* is not light pen driven. The price of the *Integrator* is $29.95.

Inkwell Systems, P.O. Box 85152 MB290, 7677 Ronson Rd., #210, San Diego, CA 92138.

Circle Reader Service Number 201.

Upgraded Home Productivity Packages

Activision, which recently acquired Creative Software, is releasing upgraded versions of *Creative Writer, Creative Filer*, and *Creative Calc*, formerly published by Creative for the Commodore 64. *Creative Writer* has been enhanced to take advantage of the 128 in 128 mode.

Each package retails for $49.95, or the three can be purchased together for $129.95.

Activision, Inc., P.O. Box 7286, Mountain View, CA 94043.

Circle Reader Service Number 202.

128-Mode Software

Free Spirit Software has introduced three programs for the Commodore 128 in 128 mode. *The Great War* ($19.95) is a World War I strategy game played across a high-resolution map of 1914 Europe. You control either the Central Powers or the Allies (the armies of 16 nations in all) in play against the computer or another player, coping with terrain, political considerations, troop strengths, weaponry, lines of supply, weather, and other factors.

BASICally SIMPLE 128 ($19.95) is a BASIC programming instruction package for the 128. The program is an updated version of the earlier package for the 64, which includes all of the 128's additional BASIC commands. *Postmaster 128* ($9.95) is an updated version of Free Spirit's Commodore 64 mailing list program, taking advantage of the 128's increased memory, to store, retrieve, and sort names, addresses, zip codes, phone numbers, and other categories.

Free Spirit Software, Inc., 5836 S. Mozart, Chicago, IL 60629.

Circle Reader Service Number 203.

Sports Tutorials

Two new packages for the 64, *Chris Evert-Lloyd Tennis* and *Jackie Stewart's Winning Formula*, are designed to teach skills, techniques, and strategies that you can use on the court or track. *Tennis* is currently available, and *Winning Formula* is scheduled for release this spring. The price for each package is $34.95.

Avant Garde Publishing Co., 37B Commercial Blvd., Novato, CA 94947.

Circle Reader Service Number 204.

Inexpensive Productivity and Educational Software

BCI has released a variety of personal productivity and educational packages for the 64, in the $4.99 and $9.99 price ranges, including low-priced three-program packs. The company has also introduced *Printer's Devil*, a $14.99 data disk of 125 graphics images for use with *The Print Shop* from Brøderbund. A second data disk with an additional 100 images is also to be announced.

BCI Software, P. O. Box 730, Ringwood, NJ 07456.

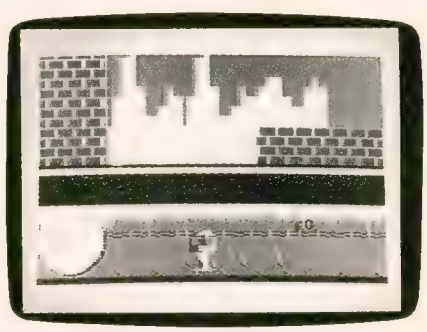
Circle Reader Service Number 205.

New 64 Software From Holland

Radarsoft, a Dutch software company entered the U.S. market several months ago with an educational program called *Maps U.S.A.* It has since announced that several of its entertainment, educational, and productivity packages will be sold here. Radarsoft's first entertainment offerings include *Floyd the Droid, The Caves of Oberon*, and *Endless*. All feature 500 smooth-scrolling screens, and retail for $39.95. Radarsoft also introduced *RadarBASIC 50K*, a utility that gives Commodore 64 or 128 owners an extra 12K memory and speeds up and simplifies some disk and tape functions, for $37.50.

Radarsoft, De Meeten 10, 4706 VG Roosendaal, The Netherlands.

Circle Reader Service Number 206.



Floyd the Droid, *a new entertainment program from Radarsoft.*

Robotics For The 64

Multibotics has announced a new line of robotic construction/experimentation sets for the 64 called Multibots. The products are distributed by Access Software. Each kit consists of software and various pieces of hardware. Designed to teach the theory of computer-controlled robotics, the kits range in price from $59.95 to $199.95.

Access Software, Inc., 2561 South 1560 West, Woods Cross, UT 84087.

Circle Reader Service Number 207.

Screen Dump Utility

Screen Dump, Etc., from IRQ, Inc., is a program that assigns different tasks to the eight function keys. These new functions include dumping any screen to a dot-addressable printer; saving screens to disk; displaying BASIC memory allocations; decimal/hexadecimal conversion; a HELP key; and a user-definable key. All function key routines can be performed at any time, even during execution of a BASIC or machine language program. After the routine is completed, the interrupted program will continue running.

Screen Dump, Etc. is available for $24.95, which includes shipping costs and a backup copy of the disk. IRQ, Inc. gives a 15-day money back trial period.

IRQ, Inc., P.O. Box 457, St. Charles, MO 63302.

Circle Reader Service Number 208.

New Products From Xetec

Fontmaster II is a full-featured word processor with 30 built-in fonts and a character set creator. Several foreign-language features, such as right-to-left editing (for Hebrew, Arabic, etc.), are included. Suggested retail price is $49.95.

Also new from Xetec is the Printer Enhancer, a hardware unit designed to interface between any microcomputer and any printer (dot matrix or letter quality). Features include variable buffer size (up to 256K), eight fonts, an IPS (Intelligent Printer Switch), which allows operation of one or two printers with independent selection of fonts, printer types, and data. The 8K buffer version for one printer is $170; the 64K buffer version for two printers is $250.

Xetec, Inc., 2804 Arnold Rd., Salina, KS 67401.

Circle Reader Service Number 209.

Financial Software From Simon & Schuster

J.K. Lasser's Your Money Manager is a home and small business accounting tool that provides a check writer, generators for financial statements, balance sheets, budget reports, and more. A variety of graphs are available for analysis of current and projected trends. If financial records are maintained accurately all year, data from *Money Manager* can be transferred to *J.K. Lasser's Your Income Tax*, another Simon & Schuster package, for an income tax report. Suggested retail price for *Money Manager* is $69.95.

Simon & Schuster Computer Software Division, 1230 Avenue of the Americas, New York, NY 10020.

Circle Reader Service Number 210.

Chess Tutorial

Paul Whitehead Teaches Chess, from Enlightenment, Inc., both teaches the game of chess and serves as an opponent. It was designed to take the user who knows nothing about chess to the point where he or she can beat a middle-level chess player. The tutorial's database is set up in a tree-like structure, allowing the user to skip over information he or she already knows, and spend as much time as is necessary in weak areas. The program retails for $49.95.

Enlightenment, Inc., 1240 Sanchez St., San Francisco, CA 94114.

Circle Reader Service Number 211.

Educational Software Series

Intelligent Software, Inc., has released a line of math tutorials, *Intelligent Tutors*, for the Commodore 64. *Algebra I* teaches about and helps students review simple and advanced algebraic functions. *Geometry* covers problems involving straight line figures, triangles, parallels, circles, and polygons. *Algebra 2* covers systems of equations and determinants, ploynomials and rational functions, and functions and conics. *Trigonometry and Advanced Topics* introduces students to concepts in trigonometry, and also deals with complex numbers and vectors, probability and statistics.

In each program, every major concept area is further subdivided into 36 problem areas, and allows students to run it in either test or practice mode. Each package retails for $49.95.

Intelligent Software, Inc., 9609 Cypress, Munster, IN 46321.

Circle Reader Service Number 212.

SpeedScript Enhancer

The *Speedplus* enhancement program adds eight features to your copy of *SpeedScript 3.0, 3.1, or 3.2.* They include a justification mode, which aligns both left and right text margins; 12-position assignable tab; two-column and two-side printing; word wrap on/off toggle; window preview of text for all margins and page lengths; partial printing from one character to the whole document; assignment of up to eight separate code values to over 26 separate print commands for easy access to special printer functions (all saved to a standard text file); and print commands to change the printer secondary address while printing, for access to special printer character sets and to both Commodore character sets.

Speedplus is available by mail order for $24.95.

LIDON Enterprises, P.O. Box 773, Elm Grove, WI 53122.

Circle Reader Service Number 213.

Graphics Software for 128

Chartpak-128 is a 128-specific version of Abacus Software's earlier *Chartpak* for the Commodore 64. The program uses the same data entry and data maintenance features, making it easy to design your own pie, bar, or line charts and graphs.

The 128 version has three times the resolution of the earlier version, and takes advantage of the extra memory in 128 mode. *Chartpak* also has built-in features for statistical functions: least squares, regression, mean, and exponential smoothing, letting you add these statistics to your charts or graphs. When you've completed a chart, you can print it out in one of two sizes on most dot-matrix printers. *Chartpak-128*'s user guide contains several tutorials with examples and sample charts. Suggested retail price is $39.95.

Abacus Software, 2201 Kalamazoo S.E., P.O. Box 7211, Grand Rapids, MI 49510.

Circle Reader Service Number 214.

Disk Utilities for 1541

Cursor Products has introduced *DMS*, a disk management system for the Commodore 1541 disk drive. *DMS* offers help in three main areas: command execution, disk security, and disk cataloging.

The utilities program lets you list the directory on screen while executing disk commands. In addition to standard commands, *DMS* has added File Append, Disk Rename, and File Lock and Unlock, which prevents you from accidentally scratching your files. The protection program features block by block data encryption, which ensures the secrecy of your confidential files; this can be used on any of your existing disks with no modifications. And the cataloging program allows for easy creation and maintenance of your library database. *DMS* retails for $34.95.

Cursor Products, R.R. 71, Box 1858, Camdenton, MO 65020.

Circle Reader Service Number 215.

COMPUTE!'s GAZETTE Author Guide

Here are some suggestions which serve to improve the speed and accuracy of publication for prospective authors. COMPUTE!'s GAZETTE is primarily interested in new and timely articles on the Commodore 128, 64, Plus/4, 16, and VIC-20. We are much more concerned with the content of an article than with its style, but articles should as be clear and well-explained as possible.

The guidelines below will permit your good ideas and programs to be more easily edited and published:

1. The upper left corner of the first page should contain your name, address, telephone number, and the date of submission.

2. The following information should appear in the upper right corner of the first page. If your article is specifically directed to one model of computer, please state the model name. In addition, *please indicate the memory requirements of programs.*

3. The underlined title of the article should start about 2/3 of the way down the first page.

4. Following pages should be typed normally, except that in the upper right corner there should be an abbreviation of the title, your last name, and the page number. For example: Memory Map/Smith/2.

5. All lines within the text of the article must be double- or triple-spaced. A one-inch margin should be left at the right, left, top, and bottom of each page. No words should be divided at the ends of lines. And please do not justify. Leave the lines ragged.

6. Standard typing or computer paper should be used (no erasable, onionskin, or other thin paper) and typing should be on one side of the paper only (upper- and lowercase).

7. Sheets should be attached together with a paper clip. Staples should not be used.

8. If you are submitting more than one article, send each one in a separate mailer with its own tape or disk.

9. Short programs (under 20 lines) can easily be included within the text. Longer programs should be separate listings. *It is essential that we have a copy of the program, recorded twice, on a tape or disk.* If your article was written with a word processor, we also appreciate a copy of the text file on the tape or disk. Please use high-quality 10 or 30 minute tapes with the program recorded on both sides. The tape or disk should be labeled with the author's name and the title of the article. Tapes are fairly sturdy, but disks need to be enclosed within plastic or cardboard mailers (available at photography, stationery, or computer supply stores).

10. A good general rule is to spell out the numbers zero through ten in your article and write higher numbers as numerals (1024). The exceptions to this are: Figure 5, Table 3, TAB(4), etc. Within ordinary text, however, the zero through ten should appear as words, not numbers.. Also, symbols and abbreviations should not be used within text: use "and" (not &), "reference" (not ref.), "through" (not thru).

11. For greater clarity, use all capitals when referring to keys (RETURN, CTRL, SHIFT), BASIC words (LIST, RND, GOTO), and the language BASIC. Headlines and subheads should, however, be initial caps only, and emphasized words are not capitalized. If you wish to emphasize, underline the word and it will be italicized during typesetting.

12. Articles can be of any length—from a single-line routine to a multi-issue series. The average article is about four to eight double-spaced, typed pages.

13. If you want to include photographs, they should be either 5×7 black and white glossies or color slides.

14. We do not consider articles which are submitted simultaneously to other publishers. If you wish to send an article to another magazine for consideration, please do not submit it to us.

15. COMPUTE!'s GAZETTE pays between $70 and $800 for published articles. In general, the rate reflects the length and quality of the article. Payment is made upon acceptance. Following submission (Editorial Department, COMPUTE!'s GAZETTE, P.O. Box 5406, Greensboro, NC 27403) it will take from two to four weeks for us to reply. If your work is accepted, you will be notified by a letter which will include a contract for you to sign and return. *Rejected manuscripts are returned to authors who enclose a self-addressed, stamped envelope.*

16. If your article is accepted and you have since made improvements to the program, please submit an entirely new tape or disk and a new copy of the article reflecting the update. We cannot easily make revisions to programs and articles. It is necessary that you send the revised version as if it were a new submission entirely, but be sure to indicate that your submission is a revised version by writing, "Revision" on the envelope and the article.

17. COMPUTE!'s GAZETTE does not accept unsolicited product reviews. If you are interested in serving on our panel of reviewers, contact our Features Editor for details.

How To Type In *COMPUTE!'s GAZETTE* Programs

Each month, COMPUTE!'s GAZETTE publishes programs for the Commodore 128, 64, Plus/4, 16, and VIC-20. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We frequently publish two programs designed to make typing easier: The Automatic Proofreader, and MLX, designed for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off then back on, erasing whatever was in memory. So be sure to *save a copy of your program before you run it.* If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from the GAZETTE, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing another key), the character is underlined. For example, A means hold down the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight SHIFTed A's).

If a key is enclosed in special brackets, [ ], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, {A} means to press CTRL-A.

The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as {LEFT} and {HOME} in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is *the quote mode.*

Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a reverse video character (a graphics symbol for cursor left). In this case, you can use the DELete key to back up and edit the line. Type another quote and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it.

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT + ← CRSR →	
{RIGHT}	← CRSR →	
{RVS}	CTRL + 9	
{OFF}	CTRL + 0	
{BLK}	CTRL + 1	
{WHT}	CTRL + 2	
{RED}	CTRL + 3	
{CYN}	CTRL + 4	

When You Read:	Press:	See:
{PUR}	CTRL + 5	
{GRN}	CTRL + 6	
{BLU}	CTRL + 7	
{YEL}	CTRL + 8	
{ F1 }	f1	
{ F2 }	SHIFT + f1	
{ F3 }	f3	
{ F4 }	SHIFT + f3	
{ F5 }	f5	
{ F6 }	SHIFT + f5	
{ F7 }	f7	
{ F8 }	SHIFT + f7	

When You Read:	Press:	See:
←	←	
↑	SHIFT + ↑	

For Commodore 64 Only

When You Read:	Press:	See:
[1]	COMMODORE + 1	
[2]	COMMODORE + 2	
[3]	COMMODORE + 3	
[4]	COMMODORE + 4	
[5]	COMMODORE + 5	
[6]	COMMODORE + 6	
[7]	COMMODORE + 7	
[8]	COMMODORE + 8	

The Automatic Proofreader

Philip I. Nelson, Assistant Editor

"The Automatic Proofreader" helps you type in program listings for the 128, 64, Plus/4, 16, and VIC-20 and prevents nearly every kind of typing mistake.

Type in the Proofreader *exactly* as listed. Since the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unfamiliar commands. After finishing, save a copy or two on disk or tape before running it. This is important because the Proofreader erases the BASIC portion of itself when you run it, leaving only the machine language portion in memory.

Next, type RUN and press RETURN. After announcing which computer it's running on, the Proofreader displays the message "Proofreader Active". Now you're ready to type in a BASIC program.

Every time you finish typing a line and press RETURN, the Proofreader displays a two-letter checksum in the upper-left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If the letters don't match, check for your mistake and correct the line.

The Proofreader ignores spaces not enclosed in quotes, so you can omit or add spaces between keywords and still see a matching checksum. However, since spaces inside quotes are almost always significant, the Proofreader pays attention to them. For example, **10 PRINT"THIS IS BASIC"** will generate a different checksum than **10 PRINT"THIS ISBA SIC"**.

A common typing error is transposition—typing two successive characters in the wrong order, like PIRNT instead of PRINT or 64378 instead of 64738. The Proofreader is sensitive to the *position* of each character within the line and thus catches transposition errors.

The Proofreader does *not* accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line by LISTing it after typing it in, moving the cursor back to the line, and pressing RETURN. LISTing the line substitutes the full keyword for the abbreviation and allows the Proofreader to work properly. The same technique works for rechecking programs you've already typed in.

If you're using the Proofreader on the Commodore 128, Plus/4, or 16, *do not perform any GRAPHIC commands while the Proofreader is active.* When you perform a command like GRAPHIC 1, the computer moves everything at the start of BASIC program space—including the Proofreader—to another memory area, causing the Proofreader to crash. The same thing happens if you *run* any program with a GRAPHIC command while the Proofreader is in memory.

Though the Proofreader doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program. However, the Proofreader is purposely difficult to dislodge: It's not affected by tape or disk operations, or by pressing RUN/STOP– RESTORE. The simplest way to disable it is to turn the computer off then on. A gentler method is to SYS to the computer's built-in reset routine (SYS 65341 for the 128, 64738 for the 64, 65526 for the Plus/4 and 16, and 64802 for the VIC). These reset routines erase any program in memory, so be sure to save the program you're typing in before entering the SYS command.

If you own a Commodore 64, you may already have wondered whether the Proofreader works with other programming utilities like "MetaBASIC." The answer is generally yes, *if you're using a 64 and activate the Proofreader after installing the other utility.* For example, first load and activate MetaBASIC, then load and run the Proofreader.

When using the Proofreader with another utility, you should disable *both* programs before running a BASIC program. While the Proofreader seems unaffected by most utilities, there's no way to promise that it will work with any and every combination of utilities you might want to use. The more utilities activated, the more fragile the system becomes.

The New Automatic Proofreader

```
10 VEC=PEEK(772)+256*PEEK(773)
   :LO=43:HI=44
20 PRINT "AUTOMATIC PROOFREADE
   R FOR ";:IF VEC=42364 THEN
   {SPACE}PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VI
   C-20"
40 IF VEC=35158 THEN GRAPHIC C
   LR:PRINT "PLUS/4 & 16"
50 IF VEC=17165 THEN LO=45:HI=
   46:GRAPHIC CLR:PRINT"128"
60 SA=(PEEK(LO)+256*PEEK(HI))+
   6:ADR=SA
70 FOR J=0 TO 166:READ BYT:POK
   E ADR,BYT:ADR=ADR+1:CHK=CHK
   +BYT:NEXT
80 IF CHK<>20570 THEN PRINT "*
   ERROR* CHECK TYPING IN DATA
    STATEMENTS":END
90 FOR J=1 TO 5:READ RF,LF,HF:
   RS=SA+RF:HB=INT(RS/256):LB=
   RS-(256*HB)
100 CHK=CHK+RF+LF+HF:POKE SA+L
   F,LB:POKE SA+HF,HB:NEXT
110 IF CHK<>22054 THEN PRINT "
   *ERROR* RELOAD PROGRAM AND
   {SPACE}CHECK FINAL LINE":EN
   D
120 POKE SA+149,PEEK(772):POKE
    SA+150,PEEK(773)
130 IF VEC=17165 THEN POKE SA+
   14,22:POKE SA+18,23:POKESA+
   29,224:POKESA+139,224
140 PRINT CHR$(147);CHR$(17);"
   PROOFREADER ACTIVE":SYS SA
150 POKE HI,PEEK(HI)+1:POKE (P
   EEK(LO)+256*PEEK(HI))-1,0:N
   EW
160 DATA 120,169,73,141,4,3,16
   9,3,141,5,3
170 DATA 88,96,165,20,133,167,
   165,21,133,168,169
180 DATA 0,141,0,255,162,31,18
   1,199,157,227,3
190 DATA 202,16,248,169,19,32,
   210,255,169,18,32
200 DATA 210,255,160,0,132,180
   ,132,176,136,230,180
210 DATA 200,185,0,2,240,46,20
   1,34,208,8,72
220 DATA 165,176,73,255,133,17
   6,104,72,201,32,208
230 DATA 7,165,176,208,3,104,2
   08,226,104,166,180
240 DATA 24,165,167,121,0,2,13
   3,167,165,168,105
250 DATA 0,133,168,202,208,239
   ,240,202,165,167,69
260 DATA 168,72,41,15,168,185,
   211,3,32,210,255
270 DATA 104,74,74,74,74,168,1
   85,211,3,32,210
280 DATA 255,162,31,189,227,3,
   149,199,202,16,248
290 DATA 169,146,32,210,255,76
   ,86,137,65,66,67
300 DATA 68,69,70,71,72,74,75,
   77,80,81,82,83,88
310 DATA 13,2,7,167,31,32,151,
   116,117,151,128,129,167,136
   ,137
```

MLX Machine Language Editor For The Commodore 64

Ottis Cowper
Technical Editor

"MLX" is a labor-saving utility that will help you enter machine language program listings without error. MLX is required to enter all Commodore 64 machine language programs published in COMPUTE!'s GAZETTE. This version of MLX was first published in the January 1986 issue; it cannot be used to enter MLX programs published prior to that date, nor can earlier versions of MLX be used to enter the listings in this issue.

Type in and save a copy of MLX. You'll need it for all future machine language programs in COMPUTE!'s GAZETTE, as well as machine language (ML) programs in our companion magazine, COMPUTE!, and COMPUTE! books. When you're ready to enter an ML program, load and run MLX. It asks you for a starting and ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing. If you're unfamiliar with ML, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0–9 and the letters A–F. But even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, MLX offers the option of clearing the workspace. The data you enter with MLX is kept in a special reserved area of memory; clearing this workspace area fills the reserved area with zeros, which will make it easier to find where you left off typing if you enter the listing in several sessions. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session there's no point in clearing the workspace, since the data you load in will fill the area with whatever values were in workspace memory at the time of the last Save.

At this point, MLX presents a menu of commands:

Enter data
Display data
Load data
Save file
Quit

Press the corresponding key to select a menu option. These commands are available only while the menu is displayed. You can get back to the menu from most options by pressing RETURN.

Entering A Listing

To begin entering data, press E. You'll be asked for the address at which you wish to begin. (If you pressed E by mistake, you can return to the command menu by pressing RETURN.) When you begin typing a listing, enter the starting address here. If you're typing in a long listing in several sessions, you should enter the address where you left off typing at the end of the previous session. In any case, make sure the address you enter corresponds to the address of a line in the MLX listing. Otherwise, you'll be unable to enter the data correctly.

After you enter the address, you'll see that address appear as a prompt with a nonblinking cursor. Now you're ready to enter data. To help prevent typing mistakes, only a few keys are active, so you may have to unlearn some habits. MLX listings consist of nine columns of two-digit numbers—eight bytes of data and a checksum. You *do not* type spaces between the columns; the new MLX automatically inserts these for you. Nor do you press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit. The only keys needed for data entry are 0–9 and A–F. Pressing most of the other keys produces a warning buzz.

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line badly, press CLR/HOME to start the line over. The RETURN key is also active, but only *before* any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line number prompt.

Beep Or Buzz?

After you type the last digit in a line, MLX calculates a checksum from the line number and the first eight columns of data, then compares it with the value in the ninth column. The formula (found in lines 370–390 of the MLX program) catches almost every conceivable typing error, including the transposition of numbers. If the values match, you'll hear a pleasant beep, the data is added to the workspace area, and the prompt for the next line of data appears (unless the line just entered was the last line of the listing—in which case you'll automatically advance to the Save option). But if MLX detects a typing error, you'll hear a low buzz and see an error message. Then MLX redisplays the line for editing.

To edit a line, move the cursor left and right using the cursor keys. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. To make corrections in a mistyped line, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

Other MLX Functions

The Display data option lets you review your work. When you select D, you'll be asked for a starting address. (As with the other menu options, pressing RETURN at this point takes you back to the command menu.) Make sure the address corresponds to a line from the listing. You can pause the scrolling display by pressing the space bar. (MLX finishes printing the current line before halting.) To resume scrolling, press the space bar again. The display continues to scroll until the ending address is reached, then the menu reappears. To break out of the display and return to the menu before the ending address is reached, press RETURN. A quick way to check your typing is to compare the reverse video checksums on the screen with the data in the rightmost column of the printed listing. If the values match, you can be sure the line is entered correctly.

The Save and Load menu options are straightforward. First, MLX asks for a filename. (Again, pressing RETURN at this prompt without entering anything returns you to the command menu.) Next, MLX asks you to press either T or D for tape or disk. If you notice the disk drive starting and stopping several times during a load or save,

don't panic; this behavior is normal because MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands. For disk, the drive prefix 0: is automatically added to the filename (line 750), so this should *not* be included when entering the name. (This also precludes the use of @ for Save-with-Replace, so remember to give each version saved a different name.) MLX saves the entire workspace area from the starting to ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports any errors detected during the save or load. (Tape users should bear in mind that the Commodore 64 is never able to detect errors when saving to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT *address*, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you originally specified. If you get one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct ending address.

The Quit menu option has the obvious effect—it stops MLX and enters BASIC at a READY prompt. Since the RUN/STOP key is disabled, Q lets you exit the program without turning off the computer. (Of course, RUN/STOP-RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or any other key to return to the menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD *"filename"*,8 for disk or LOAD *"filename"* for tape, and then RUN. (Such programs usually have 0801 as their MLX starting address.) Others must be reloaded to specific addresses with a command such as LOAD *"filename"*,8,1 for disk or LOAD *"filename"*,1,1 for tape, then started with a SYS to a particular memory address. (On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000.) In any case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

By the time you finish typing in the data for a long ML program, you'll have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type in MLX, and then test your copy *thoroughly* before first using it to enter any significant amount of data. (Incidentally, MLX is included every month on the GAZETTE DISK.) Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to ensure that you can recall your work from disk or tape. Don't let a simple typing error in MLX cost you several nights of hard work.

MLX

For instructions on entering this listing, refer to "How To Type In COMPUTE!'s GAZETTE Programs" elsewhere in this issue.

```
EK 100 POKE 56,50:CLR:DIM IN$,
       I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
       4=254:Z5=255:Z6=256:Z7=
       127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
       :BS=PEEK(55)+Z6*PEEK(56
       ):H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}"
       :S$=" ":D$=CHR$(20):Z$=
       CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
       +23:POKE I,0:NEXT:POKE
       {SPACE}SD+24,15:POKE 78
       8,52
FC 150 PRINT"{CLR}"CHR$(142)CH
       R$(8):POKE 53280,15:POK
       E 53281,15
EJ 160 PRINT T$" {RED}{RVS}
       {2 SPACES}{8 @}
       {2 SPACES}"SPC(28)"
       {2 SPACES}{OFF}{BLU} ML
       X II {RED}{RVS}
       {2 SPACES}"SPC(28)"
       {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}
       {3 SPACES}COMPUTE!'S MA
       CHINE LANGUAGE EDITOR
       {3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADD
       RESS{4}";:GOSUB300:SA=A
       D:GOSUB1040:IF F THEN18
       0
GF 190 PRINT"{BLK}{2 SPACES}EN
       DING ADDRESS{4}";:GOSUB
       300:EA=AD:GOSUB1030:IF
       {SPACE}F THEN190
KR 200 INPUT"{3 DOWN}{BLK}CLEA
       R WORKSPACE [Y/N]{4}";A
       $:IF LEFT$(A$,1)<>"Y"TH
       EN220
PG 210 PRINT"{2 DOWN}{BLU}WORK
       ING...";:FORI=BS TO BS+
       EA-SA+7:POKE I,0:NEXT:P
       RINT"DONE"
DR 220 PRINTTAB(10)"{2 DOWN}
       {BLK}{RVS} MLX COMMAND
       {SPACE}MENU {DOWN}{4}":
       PRINT T$"{RVS}E{OFF}NTE
       R DATA"
ED 230 PRINT T$"{RVS}D{OFF}ISP
       LAY DATA":PRINT T$"
       {RVS}L{OFF}OAD DATA"
JS 240 PRINT T$"{RVS}S{OFF}AVE
        FILE":PRINT T$"{RVS}Q
       {OFF}UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=
       MID$("EDLSQ",I,1)THEN A
       =I:I=5
FD 270 NEXT:ON A GOTO420,610,6
       90,700,280:GOSUB1060:GO
       TO250
EJ 280 PRINT"{RVS} QUIT ":INPU
       T"{DOWN}{4}ARE YOU SURE
        [Y/N]";A$:IF LEFT$(A$,
       1)<>"Y"THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IF
       LEN(IN$)<>4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$
       =MID$(IN$,3):GOSUB320:A
       D=AD*256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID
       $(B$,J,1):B=ASC(A$)-C4+
       (A$>"@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=
       0:A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(
       H$,B+1,1);:B=A-B*C6:PRI
       NT MID$(H$,B+1,1);:RETU
       RN
RR 360 A=INT(AD/Z6):GOSUB350:A
       =AD-A*Z6:GOSUB350:PRINT
       ":";
BE 370 CK=INT(AD/Z6):CK=AD-Z4*
       CK+Z5*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+Z5*(CK>Z7)+A
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT
       {4}";:GOSUB300:IF IN$<>
       N$ THEN GOSUB1030:IF F
       {SPACE}THEN400
EX 410 RETURN
HD 420 PRINT"{RVS} ENTER DATA
       {SPACE}":GOSUB400:IF IN
       $=N$ THEN220
JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F
        THEN PRINT IN$:PRINT"
       {UP}{5 RIGHT}";
GC 450 FOR I=0 TO 24 STEP 3:B$
       =S$:FOR J=1 TO 2:IF F T
       HEN B$=MID$(IN$,I+J,1)
HA 460 PRINT"{RVS}"B$L$;:IF I<
       24THEN PRINT"{OFF}";
HD 470 GET A$:IF A$=N$ THEN470
FK 480 IF(A$>"/"ANDA$<":")OR(A
       $>"@"ANDA$<"G")THEN540
MP 490 IF A$=R$ AND((I=0)AND(J
       =1)OR F)THEN PRINT B$;:
       J=2:NEXT:I=24:GOTO550
KC 500 IF A$="{HOME}" THEN PRI
       NT B$:J=2:NEXT:I=24:NEX
       T:F=0:GOTO440
MX 510 IF(A$="{RIGHT}")ANDF TH
       ENPRINT B$L$;:GOTO540
GK 520 IF A$<>L$ AND A$<>D$ OR
       ((I=0)AND(J=1))THEN GOS
```

```
      UB1060:GOTO470
HG 530 A$=L$+S$+L$:PRINT B$L$;
      :J=2-J:IF J THEN PRINT
      {SPACE}L$;:I=I-3
QS 540 PRINT A$;:NEXT J:PRINT
      {SPACE}S$;
PM 550 NEXT I:PRINT:PRINT"{UP}
      {5 RIGHT}";:INPUT#3,IN$
      :IF IN$=N$ THEN CLOSE3:
      GOTO220
QC 560 FOR I=1 TO 25 STEP3:B$=
      MID$(IN$,I):GOSUB320:IF
       I<25 THEN GOSUB380:A(I
      /3)=A
PK 570 NEXT:IF A<>CK THEN GOSU
      B1060:PRINT"{BLK}{RVS}
      {SPACE}ERROR: REENTER L
      INE [4]":F=1:GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FO
      R I=0 TO 7:POKE B+I,A(I
      ):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN C
      LOSE3:PRINT"{DOWN}{BLU}
      ** END OF ENTRY **{BLK}
      {2 DOWN}":GOTO700
GQ 600 F=0:GOTO440
QA 610 PRINT"{CLR}{DOWN}{RVS}
      {SPACE}DISPLAY DATA ":G
      OSUB400:IF IN$=N$ THEN2
      20
RJ 620 PRINT"{DOWN}{BLU}PRESS:
       {RVS}SPACE{OFF} TO PAU
      SE, {RVS}RETURN{OFF} TO
       BREAK[4]{DOWN}"
KS 630 GOSUB360:B=BS+AD-SA:FOR
      I=BTO B+7:A=PEEK(I):GOS
      UB350:GOSUB380:PRINT S$
      ;
CC 640 NEXT:PRINT"{RVS}";:A=CK
      :GOSUB350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA TH
      ENPRINT"{DOWN}{BLU}** E
      ND OF DATA **":GOTO220
KC 660 GET A$:IF A$=R$ THEN GO
      SUB1080:GOTO220
EQ 670 IF A$=S$ THEN F=F+1:GOS
      UB1080
AD 680 ONFGOTO630,660,630
CM 690 PRINT"{DOWN}{RVS} LOAD
      {SPACE}DATA ":OP=1:GOTO
      710
PC 700 PRINT"{DOWN}{RVS} SAVE
      {SPACE}FILE ":OP=0
RX 710 IN$=N$:INPUT"{DOWN}FILE
      NAME[4]";IN$:IF IN$=N$
      {SPACE}THEN220
PR 720 F=0:PRINT"{DOWN}{BLK}
      {RVS}T{OFF}APE OR {RVS}
      D{OFF}ISK: [4]";
FP 730 GET A$:IF A$="T"THEN PR
      INT"T{DOWN}":GOTO880
HQ 740 IF A$<>"D"THEN730
HH 750 PRINT"D{DOWN}":OPEN15,8
      ,15,"I0:":B=EA-SA:IN$="
      0:"+IN$:IF OP THEN810
SQ 760 OPEN 1,8,8,IN$+",P,W":G
      OSUB860:IF A THEN220
FJ 770 AH=INT(SA/256):AL=SA-(A
      H*256):PRINT#1,CHR$(AL)
      ;CHR$(AH);
PE 780 FOR I=0 TO B:PRINT#1,CH
      R$(PEEK(BS+I));:IF ST T
      HEN800
FC 790 NEXT:CLOSE1:CLOSE15:GOT
      O940
GS 800 GOSUB1060:PRINT"{DOWN}
      {BLK}ERROR DURING SAVE:
      [4]":GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+",P,R":G
      OSUB860:IF A THEN220
GE 820 GET#1,A$,B$:AD=ASC(A$+Z
      $)+256*ASC(B$+Z$):IF AD
      <>SA THEN F=1:GOTO850
KH 830 FOR I=0 TO B:GET#1,A$:P
      OKE BS+I,ASC(A$+Z$):IF
      {SPACE}ST AND(I<>B)THEN
       F=2:AD=I:I=B
FA 840 NEXT:IF ST<>64 THEN F=3
FQ 850 CLOSE1:CLOSE15:ON ABS(F
      >0)+1 GOTO960,970
SA 860 INPUT#15,A,A$:IF A THEN
       CLOSE1:CLOSE15:GOSUB10
      60:PRINT"{RVS}ERROR: "A
      $
GQ 870 RETURN
EJ 880 POKE183,PEEK(FA+2):POKE
      187,PEEK(FA+3):POKE188,
      PEEK(FA+4):IFOP=0THEN92
      0
HJ 890 SYS 63466:IF(PEEK(783)A
      ND1)THEN GOSUB1060:PRIN
      T"{DOWN}{RVS} FILE NOT
      {SPACE}FOUND ":GOTO690
CS 900 AD=PEEK(829)+256*PEEK(8
      30):IF AD<>SA THEN F=1:
      GOTO970
SC 910 A=PEEK(831)+256*PEEK(83
      2)-1:F=F-2*(A<EA)-3*(A>
      EA):AD=A-AD:GOTO930
KM 920 A=SA:B=EA+1:GOSUB1010:P
      OKE780,3:SYS 63338
JF 930 A=BS:B=BS+(EA-SA)+1:GOS
      UB1010:ON OP GOTO950:SY
      S 63591
AE 940 GOSUB1080:PRINT"{BLU}**
       SAVE COMPLETED **":GOT
      O220
AX 950 POKE147,0:SYS 63562:IF
      {SPACE}ST<>64 THEN970
FR 960 GOSUB1080:PRINT"{BLU}**
       LOAD COMPLETED **":GOT
      O220
DP 970 GOSUB1060:PRINT"{BLK}
      {RVS}ERROR DURING LOAD:
      {DOWN}[4]":ON F GOSUB98
      0,990,1000:GOTO220
PP 980 PRINT"INCORRECT STARTIN
      G ADDRESS (";:GOSUB360:
      PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT ";:
      AD=SA+AD:GOSUB360:PRINT
       D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
      ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH
      *256):POKE193,AL:POKE1
      94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
      *256):POKE174,AL:POKE1
      75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
      1050
HA 1040 IF(AD>511 AND AD<40960
      )OR(AD>49151 AND AD<53
      248)THEN GOSUB1080:F=0
      :RETURN
HC 1050 GOSUB1060:PRINT"{RVS}
      {SPACE}INVALID ADDRESS
       {DOWN}{BLK}":F=1:RETU
      RN
AR 1060 POKE SD+5,31:POKE SD+6
      ,208:POKE SD,240:POKE
      {SPACE}SD+1,4:POKE SD+
      4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
      TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
      240:POKE SD,0:POKE SD+
      1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
      KE SD+4,0:POKE SD,0:PO
      KE SD+1,0:RETURN
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

Directory Filer

Article on page 87.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

```
RR 10 N$="ZZ":POKE53281,0:POKE
      53280,0:NR=214:NC=211:KB
      =198:POKE808,225
CA 20 GOTO470
EB 30 POKENR,1:PRINT:PRINT"
      {CYN}ARE YOU SURE? (Y/N)
      "
PJ 40 POKEKB,0
RX 50 GETK$:IFK$=""THEN50
XH 60 POKEKB,0:RETURN
MF 70 GOSUB100:POKENR,1:PRINT:
      PRINT"{CYN}*** WORKING *
      ***{4 SPACES}":RETURN
SD 80 POKENR,1:PRINT"{CYN}":PR
      INTMID$(M$,4,16):RETURN
GB 90 M$="":POKENR,1:PRINT:PRI
      NT"{30 SPACES}":GOSUB120
      :RETURN
AS 100 POKENR,RL+2:PRINT:PRINT
      TAB(CL*20);"{YEL}"MID$(
      N$(RL+(I+1)*CL+D-1),4,1
      6)
GQ 110 RETURN
XR 120 POKENR,R+2:PRINT:PRINTT
      AB(C*20);"{CYN}{RVS}";M
      ID$(N$(R+(I+1)*C+D-1),4
      ,16)
SS 130 RETURN
EP 140 PRINT"{CLR}{YEL}"HE$;
MP 150 IFD>1THENPOKENC,21:PRIN
      T" P = PRIOR SCREEN "
EC 160 IFD=<N-40THENPOKENC,21:
      PRINT" N = NEXT SCREEN
      {2 SPACES}"
XG 170 I=INT((N-D-1)/2+.5):IFI
      >19THENI=19
RC 180 GOSUB80:POKENR,3:PRINT"
      {YEL}"
DC 190 FORX=DTOD+I
HS 200 PRINTMID$(N$(X),4,16)",
      ";
GX 210 PRINTT$(ASC(N$(X))ANDNO
      T248);
QE 220 IF(ASC(N$(X))AND64)=64T
      HENPRINT"<";
KP 230 IFASC(N$(X+I+1)+CHR$(0)
      )=0THEN280
MA 240 PRINTTAB(20);MID$(N$(X+
      I+1),4,16)",";
GB 250 PRINTT$(ASC(N$(X+I+1))A
      NDNOT248);
KD 260 IF(ASC(N$(X+I+1))AND64)
      =64THENPRINT"<";
PK 270 PRINT
FQ 280 NEXT:IFR>ITHENR=I+1
CR 285 IFR>ITHENR=I
BR 290 GOSUB120:RETURN
AC 300 GOSUB40:CL=C:RL=R
GS 310 IFK$=CHR$(13)ORK$="{F1}
      "ORK$="-"ORK$=","ORK$="
```

```
        "ORK$="{STOP}"THENRETU
        RN
DB 320  IFK$="{HOME}"THENR=1:C=
        Ø
QD 330  IFK$="{RIGHT}"ORK$="
        {LEFT}"THENC=NOTCAND1
SD 340  IFK$="{DOWN}"ORK$="{UP}
        "THENR=(R+1+2*(K$>"
        {DOWN}"))
PK 350  IFC>N-1THENR=1:C=Ø
FC 360  IFR>I+1THENR=1
AH 370  IFR<1THENR=I+1
AG 380  IFN$(R+(I+1)*C+D-1)=""T
        HEN330
FA 390  IF(CL<>C)OR(RL<>R)THENG
        OSUB100:GOSUB120
BJ 400  IFK$="P"ANDD>1THEND=D-4
        Ø:GOSUB140
KH 410  IFK$="N"ANDD=<N-40THEND
        =D+40:GOSUB140
CP 420  GOTO300
ME 430  POKENR,7:PRINT:PRINT"
        {RIGHT}{3 SPACES}{YEL}A
        RE YOU SURE? (Y/N)
        {4 SPACES}{RIGHT}"
DR 440  GOSUB40:IFK$="Y"THEN144
        Ø
EQ 450  IFK$="{STOP}"THEN440
KD 460  RETURN
JD 470  PRINT"{CLR}{DOWN}{CYN}U
        **********
        ***I
GQ 480  PRINT"B{5 SPACES}{YEL}D
        IRECTORY FILER{CYN}
        {6 SPACES}B"
QC 490  PRINT"B{26 SPACES}B"
CS 500  PRINT"B {YEL}INSERT DIS
        KETTE IN DRIVE{CYN} B"
KR 510  PRINT"J**********
        **********K
CX 520  FORX=1TO6:N$=N$+N$:NEXT
DK 530  N$=MID$(N$,2):N$=N$+N$
MK 540  FORX=828TO861
FM 550  READY:POKEX,Y:NEXT
RA 560  FORX=1TO30:Z$=Z$+CHR$(Ø
        ):NEXT
XQ 570  DIMN$(144),S(18),T$(4):
        D=1:N=Ø:F=Ø:B=1:R=1:C=Ø
KQ 580  FORX=ØTO17:READY:S(X)=Y
        :NEXT
HH 590  T$(1)="S":T$(2)="P":T$(
        3)="U":T$(4)="R"
ES 600  LN$=CHR$(130)+CHR$(18)+
        CHR$(18)+"----------
        ---"+LEFT$(Z$,11)
PP 610  PRINT"{DOWN}U**********
        **********I"
DB 620  PRINT"B {YEL}PRESS
        {RVS}RETURN{OFF} TO CON
        TINUE{CYN} B"
XM 630  PRINT"J**********
        **********K"
GK 640  GOSUB40:IFK$="{STOP}"TH
        ENGOSUB430
PP 650  POKENR,7:PRINT:PRINT"
        {RIGHT}{4 SPACES}{YEL}R
        EADING DISK NAME
        {5 SPACES}{RIGHT}"
XH 660  OPEN15,8,15,"I0":OPEN1,
        8,3,"$"
CP 670  SYS828:INPUT#15,EN$,EM$
        :IFEN$="ØØ"THEN710
KK 680  POKENR,7:PRINT
AC 690  PRINT"{RIGHT}{3 SPACES}
        {YEL}DISK READ ERROR #
        {SPACE}"EN$"{2 SPACES}
        {RIGHT}"
SS 700  PRINT:GOTO1480
JE 710  HE$=MID$(N$,143,16)+","
        +MID$(N$,161,2)
RM 720  POKENR,3:PRINT:PRINT"
        {RIGHT}{3 SPACES}"HE$"
        {4 SPACES}{RIGHT}"
QB 730  POKENR,7:PRINT:PRINT"
        {RIGHT}{4 SPACES}READIN
        G ENTRY #"N"{2 SPACES}
        {2 RIGHT}"
JP 740  SYS828:FORX=1TO254STEP3
        2:Y=ASC(MID$(N$,X,1))AN
        D127
CQ 750  IFY=ØTHEN770
BA 760  N=N+1:N$(N)=MID$(N$,X,3
        Ø)
BH 770  POKENR,7:PRINT:POKENC,2
        Ø:PRINTN
PD 780  NEXT
RB 790  IFST=ØTHEN730
AK 800  PRINT"{UP}{RIGHT}
        {4 SPACES}TOTAL ENTRIES
        ={8 RIGHT}"
QX 810  FORX=1TO1500:NEXT
GS 820  CLOSE1
CD 830  M$="":GOSUB140
PC 840  GOSUB300:F=R+(I+1)*C+D-
        1
FK 850  IFK$="-"THEN990
CG 860  IFK$=" "ANDN>1THEN1040
EF 870  IFK$=","THEN1120
FE 880  IFK$="{STOP}"THEN1190
XB 890  IFK$="{F1}"THEN1230
BR 900  M$=N$(F):GOSUB80
DC 910  GOSUB300:T=R+(I+1)*C+D-
        1
XJ 920  IFF=T-1ORF=TTHENGOSUB90
        :GOTO840
RJ 930  GOSUB70
JD 940  IFF>TTHENV=-1
DP 950  IFF<TTHENV=1:T=T-1
SQ 960  N$(F)=N$(F+V):F=F+V:IFF
        <>TTHEN960
GD 970  N$(T)=M$
BF 980  GOTO830
SC 990  GOSUB70:B=Ø
KR 1000 N=N+1:FORX=NTOF+1STEP-
        1
SK 1010 N$(X)=N$(X-1):NEXT
EA 1020 N$(F)=LN$
ES 1030 GOTO830
KJ 1040 GOSUB30:IFK$<>"Y"THENG
        OSUB90:GOTO840
ER 1050 GOSUB70:B=Ø
JB 1060 N=N-1:FORX=FTON
RE 1070 N$(X)=N$(X+1):NEXT
SM 1080 N$(N+1)=""
RC 1090 IFN<C+1THENC=Ø
FF 1100 IFF=N+1THENR=R+(R>1)
HF 1110 GOTO830
CA 1120 A=ASC(N$(F))
KX 1130 IFA=13ØTHENA=194:GOTO1
        150
QG 1140 IFA=194THENA=13Ø
DQ 1150 N$(F)=CHR$(A)+RIGHT$(N
        $(F),29)
RX 1160 POKENR,RL+2:PRINT:PRIN
        TTAB(CL*20+18);
JX 1170 PRINT"{YEL}"CHR$(-60*(
        A=194));CHR$(-32*(A=13
        Ø))
QP 1180 GOTO840
RE 1190 GOSUB100
JH 1200 GOSUB30:IFK$="Y"THEN14
        40
HH 1210 IFK$="{STOP}"THEN1200
CR 1220 GOSUB90:GOTO840
KR 1230 GOSUB100:GOSUB30:IFK$<
        >"Y"THENGOSUB90:GOTO84
        Ø
CK 1240 POKENR,1:PRINT:PRINT"
        {CYN}WRITING DIRECTORY
        {2 SPACES}"
RK 1250 IFN/8=INT(N/8)THEN1270
CP 1260 N=N+1:N$(N)=Z$:GOTO125
        Ø
QS 1270 S=Ø:T=18:S(N/8+.5)=255
        :N=1:OPEN2,8,2,"#"
JJ 1280 IFS(S+1)=255THENT=Ø
DM 1290 PRINT#15,"B-P";2;Ø
SH 1300 PRINT#2,CHR$(T);CHR$(S
        (S+1));:P=2
BJ 1310 FORX=NTON+7:PRINT#15,"
        B-P";2;P
RG 1320 PRINT#2,N$(X);:P=P+32:
        NEXT:N=X
HR 1330 PRINT#15,"U2";2;Ø;18;S
        (S):INPUT#15,EN$,EM$:I
        FEN$="ØØ"THEN1370
CJ 1340 POKENR,1:PRINT
XD 1350 PRINT"{CYN} DISK WRITE
         ERROR # "EN$
ED 1360 FORT=1TO2000:NEXT:GOTO
        1440
QA 1370 S=S+1:IFS(S)<>255GOTO1
        280
FQ 1380 IFBTHEN1410
QD 1390 PRINT#2,CHR$(Ø);CHR$(2
        55);Z$:PRINT#15,"U2";2
        ;Ø;18;18
DF 1400 POKENR,1:PRINT:PRINT"
        {CYN}VALIDATING BAM
        {4 SPACES}":PRINT#15,"
        V0"
PD 1410 CLOSE2:PRINT#15,"I0":C
        LOSE15
SA 1420 POKENR,1:PRINT:PRINT"
        {CYN}ANOTHER DISK? (Y/
        N)"
BE 1430 GOSUB40:IFK$="Y"THENRU
        N
DE 1440 PRINT"{CLR}":POKENR,7:
        PRINT
QS 1450 PRINT"{CYN}U**********
        **********I"
FD 1460 PRINT"B{4 SPACES}{YEL}
        PROGRAM TERMINATED
        {4 SPACES}{CYN}B"
AP 1470 PRINT"J**********
        **********K"
DJ 1480 CLOSE1:CLOSE2:CLOSE15
JD 1490 SYS 65418
CP 1500 DATA 160,2,177,45,153,
        137,0,200,192,6,208,24
        6,162
SQ 1510 DATA 1,32,198,255,32,2
        28,255,164,142,145,140
        ,200
KH 1520 DATA 132,142,196,139,2
        08,242,76,204,255
HG 1530 DATA 1,4,7,10,13,16,2,
        5,8,11,14,17,3,6,9,12,
        15,18
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

Windows On The 128

Article on page 88.

Program 1: 128 Window Demo

```
EK 100 MODE=RGR(G)
CD 110 REM *CHECK TO SEE IF IT
       S A 40 OR 80{10 SPACES}
       COLUMN DISPLAY*
JE 120 IF MODE=5 THEN BEGIN
JX 130 :{3 SPACES}A=78:B=40:C=
       38
QG 140 :{3 SPACES}FAST
BX 150 BEND:ELSE BEGIN
```

```
KR 160 :{3 SPACES}A=38:B=20:C=
       18:BEND
SQ 170 REM *START THE MAIN LOO
       P*
GG 180 SCNCLR
XK 190 PRINTCHR$(27)"M";: REM
       {SPACE}*SET NO-SCROLL*
FP 200 X1=INT(RND(0)*B):Y1=INT
       (RND(0)*12)
BS 210 X2=INT((RND(0)*B)+C):Y2
       =INT(RND(0)*10+12)
XA 220 IFX1>X2 OR Y1>Y2 OR X2>
       A OR Y2 >22 ORX1<2 OR Y
       1<2 THEN200
RB 230 REM *CREATE THE LARGER
       {SPACE}WINDOW AND
       {12 SPACES}DRAW THE BOR
       DER*
BF 240 WINDOW X1-1,Y1-1,X2+1,Y
       2+1 ,1
AD 250 X=RWINDOW(0):Y=RWINDOW(
       1)
QG 260 PRINT"O";:FORI=1TO(Y-1)
       :PRINT"{Y}";:NEXT:PRINT
       "P"
EF 270 FORI=1TOX-1:PRINT"{H}";
       TAB(Y);"{M}":NEXT
MP 280 PRINT"L";:FORI=1TO(Y-1)
       :PRINT"{P}";:NEXT:PRINT
       "@"
PX 290 REM *CREATE WINDOW AND
       {SPACE}FILL IT*
JC 300 WINDOW X1,Y1,X2,Y2
HJ 310 A1=(RND(0)*38+40):IFRND
       (0)<.2THENPRINTCHR$(15)
       ;
GF 320 IFRND(0)>.9THENPRINTCHR
       $(18);
HB 330 IF RND(0)>.8 THEN BEGIN
PX 340 REM *CHOOSE NORMAL OR R
       EVERSE SCREEN*
DS 350 :{5 SPACES}IF S$="N" TH
       EN S$="R":PRINTCHR$(27)
       S$;:ELSE PRINTCHR$(27)"
       N";:S$="N"
AM 360 BEND
DK 370 REM *CHOOSE COLOR FOR D
       ISPLAY*
AE 380 PRINTCHR$(149+D);:D=D+1
       :IFD>7THEND=0
BH 390 IFD=3THEND=4
SK 400 FORC1=0 TO (X * Y):PRIN
       TCHR$(A1);:NEXT:PRINTCH
       R$(143);CHR$(146);CHR$(
       5)
GM 410 GOTO200
```

Program 2: Window Save For 40 Columns

```
BD 100 GRAPHIC 1:GRAPHIC 0:GOS
       UB150:COLOR 0,1
EC 110 PRINT"{CLR}";:FOR A=1 T
       O 24:COLOR 5,(AAND15)+1
       -(A=16):PRINT"ABCDEFGHI
       JKLMNOPQRSTUVWXYZ123456
       7890ASZX";:NEXT
SH 120 WINDOW 5,3,35,13:SYS 81
       92
AB 130 PRINT "{CLR}{5 DOWN}
       {3 SPACES}PRESS ANY KEY
        TO CONTINUE"
AD 140 GETKEY A$:SYS 8195:SLEE
       P 2:GOTO130
JH 150 C=0:FORA=8192TO8335:REA
       DB:C=C+B:POKEA,B:NEXT:I
       FC<>20215THENPRINT"
       {CLR}DATA ERROR":END:EL
       SE RETURN
MJ 160 DATA 169,0,44,169,1,133
       ,143,32,100,32,169,0,13
       3,250
QS 170 DATA 169,48,133,251,165
       ,231,56,229,230,133,158
       ,230,158,165
EF 180 DATA 228,56,229,229,133
       ,159,230,159,165,158,13
       3,254,160,0
FR 190 DATA 165,143,208,7,177,
       141,145,250,76,57,32,17
       7,250,145
MC 200 DATA 141,200,198,254,20
       8,236,165,250,24,101,15
       8,133,250,165
QE 210 DATA 251,105,0,133,251,
       32,130,32,198,159,208,2
       10,165,142
HM 220 DATA 201,212,176,11,165
       ,139,133,141,165,140,13
       3,142,76,18
MX 230 DATA 32,96,165,230,133,
       141,169,4,133,142,166,2
       29,240,6
XR 240 DATA 32,130,32,202,208,
       250,165,141,133,139,165
       ,142,24,105
RQ 250 DATA 212,133,140,96,165
       ,141,24,105,40,133,141,
       165,142,105,0,133,142,9
       6
```

Program 3: Window Save For 80 Columns

```
RE 100 GRAPHIC 1:GRAPHIC 5:GOS
       UB150:COLOR 0,1
FC 110 PRINT"{CLR}";:FOR A=1 T
       O 48:COLOR 5,(AAND7)+2:
       PRINT"ABCDEFGHIJKLMNOPQ
       RSTUVWXYZ1234567890ASZX
       ";:NEXT
KQ 120 WINDOW 10,3,70,13:SYS 8
       192
QJ 130 PRINT "{CLR}{5 DOWN}
       {16 SPACES}PRESS ANY KE
       Y TO CONTINUE"
AD 140 GETKEY A$:SYS 8195:SLEE
       P 2:GOTO130
GS 150 C=0:FORA=8192TO8377:REA
       DB:C=C+B:POKEA,B:NEXT:I
       FC<>24072THENPRINT"
       {CLR}DATA ERROR":END:EL
       SE RETURN
JQ 160 DATA 169,0,44,169,1,133
       ,143,32,118,32,169,0,13
       3,250
QS 170 DATA 169,48,133,251,165
       ,231,56,229,230,133,158
       ,230,158,165
RA 180 DATA 228,56,229,229,133
       ,159,230,159,165,158,13
       3,254,165,142
EC 190 DATA 162,18,32,162,32,1
       65,141,162,19,32,162,32
       ,160,0
FQ 200 DATA 162,31,165,143,208
       ,8,32,174,32,145,250,76
       ,75,32
GB 210 DATA 177,250,32,162,32,
       200,198,254,208,232,165
       ,250,24,101
SG 220 DATA 158,133,250,165,25
       1,105,0,133,251,32,148,
       32,198,159
DS 230 DATA 208,192,165,142,20
       1,9,176,11,165,139,133,
       141,165,140
KP 240 DATA 133,142,76,18,32,9
       6,165,230,133,141,169,0
       ,133,142
RC 250 DATA 166,229,240,6,32,1
       48,32,202,208,250,165,1
       41,133,139
JF 260 DATA 165,142,24,105,8,1
       33,140,96,165,141,24,10
       5,80,133
JJ 270 DATA 141,165,142,105,0,
       133,142,96,142,0,214,44
       ,0,214
HE 280 DATA 16,251,141,1,214,9
       6,142,0,214,44,0,214,16
       ,251,173,1,214,96
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

Power BASIC: Controlled Keyboard Input

Article on page 95.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Program 1: Controlled Keyboard Input

```
HR 100 PRINT"{CLR}READING DATA
        STATEMENTS..."
KR 110 FORB=49152TO49604:READD
       :POKEB,D:CK=CK+D:NEXT
KG 120 IFCK<>57716THEN PRINT"E
       RROR IN DATA STATEMENTS
       ":END
JG 130 PN$="INPUT.OBJ":FORJ=1T
       OLEN(PN$):POKE704+J,ASC
       (MID$(PN$,J,1)):NEXTJ
ME 140 PRINT"{DOWN}{RVS}D{OFF}
       ISK OR {RVS}T{OFF}APE?
       {SPACE}";:DEVICE=8
JJ 150 GETA$:IFA$="T"THENDEVIC
       E=1:GOTO170
RE 160 IFA$<>"D"THEN150
DK 170 PRINTA$:POKE780,15:POKE
       781,DEVICE:POKE782,255:
       SYS65466
HP 180 POKE780,LEN(PN$):POKE78
       1,193:POKE782,2:SYS6546
       9
QS 190 BA=49152:HI=INT(BA/256)
       :LO=BA-HI*256:POKE251,L
       O:POKE252,HI
RK 200 EA=49604:HI=INT(EA/256)
       :LO=EA-HI*256+1:POKE780
       ,251:POKE781,LO:POKE782
       ,HI
XH 210 PRINT"SAVING ML VERSION
        OF "PN$:SYS65496
PG 220 DATA 56,32,240,255,132,
       139,173,136
QS 230 DATA 2,168,169,0,202,48
       ,8,24
BJ 240 DATA 105,40,144,248,200
       ,208,245,24
ES 250 DATA 101,139,144,1,200,
       133,139,133
FJ 260 DATA 167,132,140,152,24
       ,105,212,133
RK 270 DATA 168,173,24,208,41,
       2,141,195
```

```
XK 280 DATA 193,240,4,169,127,
       208,2,169
JK 290 DATA 63,141,240,192,162
       ,87,169,32
DG 300 DATA 157,0,2,202,16,250
       ,232,134
EK 310 DATA 141,164,141,177,13
       9,9,128,145
FP 320 DATA 139,32,228,255,240
       ,251,72,164
GR 330 DATA 141,177,139,41,127
       ,145,139,104
DQ 340 DATA 162,4,221,29,193,2
       40,5,202
AF 350 DATA 16,248,48,29,224,4
       ,208,3
MH 360 DATA 76,42,193,138,10,1
       70,189,34
HS 370 DATA 193,141,132,192,23
       2,189,34,193
AD 380 DATA 141,133,192,32,0,1
       6,76,73
CC 390 DATA 192,201,32,144,188
       ,201,96,144
DX 400 DATA 8,201,193,144,180,
       201,219,176
AG 410 DATA 176,164,141,196,14
       2,240,170,174
MF 420 DATA 195,193,208,7,201,
       96,144,3
JX 430 DATA 56,233,128,153,0,2
       ,32,235
KD 440 DATA 192,173,134,2,145,
       167,230,141
GS 450 DATA 76,73,192,166,141,
       228,142,240
GD 460 DATA 136,230,141,96,166
       ,141,240,129
FS 470 DATA 198,141,96,164,141
       ,208,1,96
XR 480 DATA 198,141,185,0,2,13
       6,153,0
AQ 490 DATA 2,32,235,192,200,2
       00,196,142
JA 500 DATA 144,240,169,32,153
       ,0,2,32
AP 510 DATA 235,192,96,201,193
       ,144,5,41
DB 520 DATA 127,76,250,192,201
       ,65,144,2
AC 530 DATA 41,63,145,139,96,1
       64,141,196
DR 540 DATA 142,208,1,96,169,3
       2,72,185
XF 550 DATA 0,2,170,104,153,0,
       2,32
PC 560 DATA 235,192,200,196,14
       2,240,5,138
JS 570 DATA 72,76,7,193,96,29,
       157,148
PA 580 DATA 20,13,187,192,196,
       192,253,192
QM 590 DATA 203,192,169,0,133,
       144,162,79
MQ 600 DATA 189,0,2,201,32,208
       ,6,202
CE 610 DATA 16,246,230,144,96,
       232,134,142
XA 620 DATA 165,143,208,13,162
       ,183,160,193
HE 630 DATA 142,94,193,140,95,
       193,76,91
JJ 640 DATA 193,162,188,160,19
       3,142,94,193
SM 650 DATA 140,95,193,160,0,1
       85,0,16
EC 660 DATA 240,7,153,52,3,200
       ,76,93
FR 670 DATA 193,162,0,189,0,2,
       153,52
SR 680 DATA 3,200,232,228,142,
       208,244,165
KM 690 DATA 143,208,9,169,34,1
       53,52,3
XG 700 DATA 200,76,144,193,169
       ,34,153,52
GH 710 DATA 3,200,169,41,153,5
       2,3,200
EF 720 DATA 169,0,153,52,3,165
       ,122,141
QS 730 DATA 181,193,165,123,14
       1,182,193,169
QR 740 DATA 52,133,122,169,3,1
       33,123,32
RB 750 DATA 165,169,173,181,19
       3,133,122,173
HS 760 DATA 182,193,133,123,96
       ,0,0,84
QA 770 DATA 36,178,34,0,84,49,
       178,197
XJ 780 DATA 40,34,0,0,170
```

Program 2: Demo

```
QX 100 IFA=0THENA=1:LOAD"INPUT
       .OBJ",8,1
CM 110 PRINT"{CLR}{3 DOWN}ENTE
       R YOUR NAME- ";
HQ 120 LNG=22:TYP=0:GOSUB210
DA 130 PRINT:PRINTT$:PRINT"
       {2 DOWN}ENTER THE PRICE
       -$";
BF 140 LNG=5:TYP=1:GOSUB210
GK 150 IFT1>99.99THEN140
CC 160 PRINT:PRINTT1:PRINT:PRI
       NT"{DOWN}MORE (Y/N)?"
RC 170 WAIT198,1:GETK$
JX 180 IFK$="Y"THEN110
SH 190 IFK$<>"N"THEN170
MB 200 END
ES 210 POKE142,LNG:POKE143,TYP
       :SYS49152:IF(ST AND 1)T
       HENT$="":T1=0
CD 220 RETURN
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

Dunk

See instructions in article on page 80 before typing in.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

```
C000:A5 A2 8D C4 CE 20 FB C0 AA
C008:A9 00 8D C7 CE 8D B8 CE 79
C010:8D B9 CE 20 93 C1 A0 17 9E
C018:A9 00 99 00 D4 88 10 FA 85
C020:A9 1F 8D 18 D4 AD B6 CE 0B
C028:CD B8 CE 90 03 8D B8 CE 30
C030:20 3D C1 A9 64 8D 01 D4 14
C038:A9 00 8D 05 D4 A9 00 85 63
C040:02 A9 80 8D 04 D4 A9 81 5E
C048:8D 04 D4 A4 02 A2 00 B9 CA
C050:17 C7 10 05 29 9F 4C 5F 61
C058:C0 C9 41 90 02 29 1F 9D 6E
C060:6B 05 A9 07 9D 6B D9 C8 95
C068:C0 28 D0 02 A0 00 E8 E0 46
C070:1A D0 DC E6 02 A5 02 C9 B1
C078:28 D0 04 A9 00 85 02 A2 1A
C080:07 A5 A2 C5 A2 F0 FC CA 3D
C088:10 F7 AD 00 DC 29 10 C9 3B
C090:10 F0 AE 20 F2 C2 20 93 A4
C098:C1 20 E0 C0 20 FB C0 20 BD
C0A0:3D C1 20 F4 C3 CE 70 CE 8D
C0A8:D0 09 AD 71 CE 8D 70 CE FD
C0B0:20 BA C4 20 59 C6 20 C9 7B
C0B8:C0 20 E1 FF D0 E4 AD 00 54
C0C0:DC 29 10 C9 10 F0 F7 D0 9E
C0C8:D9 A2 06 A0 00 88 D0 FD 6C
C0D0:CA D0 FA 60 41 81 C1 62 47
C0D8:A2 E2 3F 3F 3F D3 D3 D3 05
C0E0:98 48 8A 48 A0 02 20 3F 23
C0E8:C7 29 07 AA BD 7E C2 99 2B
C0F0:FC 00 88 88 10 F0 68 AA 4A
C0F8:68 A8 60 A0 07 A9 00 85 53
C100:F8 99 50 CE 88 C0 02 D0 79
C108:F8 A9 05 8D 70 CE 8D 71 37
C110:CE A9 19 8D B0 CE 8D C2 FF
C118:CE A9 00 A0 06 99 B1 CE 40
C120:88 10 FA A9 00 8D C3 CE 72
C128:A9 14 8D 01 D4 A9 0A 8D 36
C130:0C D4 A9 F2 8D 17 D4 A9 6F
C138:64 8D 16 D4 60 8A 48 98 B7
C140:48 A9 00 8D C1 CE AD C1 91
C148:CE 0A 0A 18 69 05 AA A0 CD
C150:22 18 20 F0 FF A9 99 20 F7
C158:D2 FF AD C1 CE 0A A8 B9 C0
C160:B0 CE AA B9 B1 CE D0 19 64
C168:48 8A C9 64 B0 12 48 A9 3A
C170:20 20 D2 FF 68 C9 0A B0 95
C178:07 48 A9 20 20 D2 FF 68 7D
C180:68 20 CD BD EE C1 CE AD 9F
C188:C1 CE C9 05 D0 B8 68 A8 0D
C190:68 AA 60 A9 93 20 D2 FF 5C
C198:A9 00 8D 20 D0 8D 21 D0 74
C1A0:A9 02 85 02 A6 02 BD 7B 7E
C1A8:C2 8D 86 02 A0 02 A9 0D 4F
C1B0:20 D2 FF 88 10 F8 A9 04 3D
C1B8:85 03 A9 07 38 E5 03 A8 6D
C1C0:A9 20 20 D2 FF 88 10 F8 8D
C1C8:A9 48 A0 C2 20 1E AB C6 0B
C1D0:03 10 E7 C6 02 10 CD A2 D1
C1D8:13 A0 1A 18 20 F0 FF A9 41
C1E0:62 A0 C2 20 1E AB A9 04 0F
C1E8:85 02 20 3F C7 29 0F 18 C0
C1F0:69 09 A8 20 3F C7 29 02 EF
C1F8:18 65 02 AA 18 20 F0 FF EF
C200:A9 77 A0 C2 20 1E AB A5 EE
C208:02 18 69 08 85 02 C9 14 1E
C210:D0 D8 A2 02 A0 20 18 20 7E
C218:F0 FF A9 86 A0 C2 20 1E 22
C220:AB A9 13 85 02 A9 90 A0 19
C228:C2 20 1E AB C6 02 D0 F5 6B
C230:A9 A2 A0 C2 18 20 1E AB 9C
C238:A2 03 A0 22 18 20 F0 FF 29
C240:A9 B4 A0 C2 20 1E AB 60 39
C248:DF 12 A6 A6 A6 A6 A6 A6 45
C250:A6 A6 A6 A6 A6 A6 A6 A6 D5
C258:A6 A6 A6 A6 A6 A6 A6 DF 17
C260:0D 00 9E 12 20 33 11 9D EE
C268:20 32 11 9D 20 31 11 9D 0C
C270:20 32 11 9D 20 33 00 92 EE
C278:20 20 00 04 06 03 00 03 95
C280:0C 00 03 0C 03 0C 96 B0 53
C288:C0 C0 C0 C0 C0 C0 AE 00 29
C290:11 9D 9D 9D 9D 9D 9D 9D CF
C298:9D DD 20 20 20 20 20 20 4C
C2A0:DD 00 11 9D 9D 9D 9D 9D 4D
C2A8:9D 9D 9D AD C0 C0 C0 C0 3E
C2B0:C0 C0 BD 00 9E 42 41 4C 4B
C2B8:4C 11 11 11 11 9D 9D 9D B3
C2C0:9D 48 49 54 53 11 11 11 A7
C2C8:11 9D 9D 9D 9D 9D 4D 49 13
C2D0:53 53 45 53 11 11 11 11 B2
C2D8:9D 9D 9D 9D 9D 9D 50 4F 75
C2E0:49 4E 54 53 11 11 11 11 5E
C2E8:9D 9D 9D 9D 9D 48 49 47 1A
C2F0:48 00 78 A9 6E 8D 14 03 19
C2F8:A9 C3 8D 15 03 A9 1B 8D C9
C300:11 D0 A9 81 8D 1A D0 A9 B1
C308:7F 8D 0D DC A9 FA 8D 12 88
C310:D0 58 A9 FF 8D 15 D0 A0 4E
C318:07 B9 46 C3 99 30 CE B9 7B
```

```
C320:4E C3 99 00 CE B9 56 C3 C0
C328:99 10 CE B9 5E C3 99 20 4B
C330:CE B9 66 C3 99 27 D0 88 2A
C338:10 DF A0 7F B9 97 C6 99 1F
C340:40 03 88 10 F7 60 0D 0D 23
C348:0D 0E 0E 0E 0E 0E 64 64 52
C350:64 64 64 64 64 64 00 00 AA
C358:00 00 00 00 00 00 42 82 E6
C360:C2 00 00 00 00 00 01 02 4D
C368:03 01 01 01 01 01 A9 01 42
C370:8D 19 D0 A9 00 85 04 A0 78
C378:07 A2 0E B9 00 CE 9D 00 FF
C380:D0 B9 20 CE 9D 01 D0 B9 1C
C388:10 CE 0A 66 04 B9 30 CE A9
C390:99 F8 07 CA CA 88 10 E3 2D
C398:A5 04 8D 10 D0 A9 FA 8D 57
C3A0:12 D0 AD 0D DC 4A 90 49 66
C3A8:EE C3 CE D0 03 EE C3 CE A9
C3B0:AD C3 CE 8D 03 D4 AD C5 3F
C3B8:CE 69 32 8D C5 CE 8D 16 BB
C3C0:D4 49 FF 29 1F 8D 08 D4 AB
C3C8:CE C8 CE D0 21 A9 14 8D 36
C3D0:C8 CE AD C7 CE F0 17 CE D9
C3D8:C7 CE A9 32 8D 0F D4 A9 4C
C3E0:1A 8D 13 D4 A9 10 8D 12 43
C3E8:D4 A9 11 8D 12 D4 4C 31 ED
C3F0:EA 4C BC FE A0 02 A9 04 EC
C3F8:99 90 CE 99 A0 CE B9 20 B8
C400:CE 85 FB B9 00 CE 85 FA AE
C408:AD 00 DC 29 0F C9 0F D0 25
C410:03 4C A7 C4 C0 01 F0 0F 6A
C418:48 39 FC 00 D9 FC 00 F0 67
C420:05 68 59 FC 00 48 68 4A 7D
C428:B0 14 B9 20 CE D9 D4 C0 90
C430:F0 09 C6 FB C6 FA A9 02 84
C438:99 90 CE 4C 6C C4 4A B0 0D
C440:14 B9 20 CE D9 D7 C0 F0 D3
C448:09 E6 FB E6 FA A9 03 99 1C
C450:90 CE 4C 6C C4 4A B0 0A E0
C458:C6 FA A9 00 99 90 CE 4C 32
C460:6C C4 4A B0 07 E6 FA A9 19
C468:01 99 90 CE A5 FB 38 F9 5F
C470:D4 C0 85 05 18 79 DD C0 B8
C478:C5 FA 90 24 B9 DA C0 18 CA
C480:65 05 C5 FA B0 1A B9 90 58
C488:CE 99 A0 CE A9 40 8D 04 4E
C490:D4 A9 41 8D 04 D4 A5 FA A9
C498:99 00 CE A5 FB 99 20 CE 78
C4A0:88 30 03 4C F6 C3 60 A9 D0
C4A8:40 8D 04 D4 A0 02 A9 04 E7
C4B0:99 90 CE 99 A0 CE 88 10 FF
C4B8:F5 60 A2 07 AD 1F D0 8D 33
C4C0:72 CE BD 50 CE F0 07 C9 06
C4C8:01 F0 49 4C 81 C5 AD B0 2C
C4D0:CE F0 3E A5 F8 D0 3A A9 49
C4D8:01 85 F8 CE B0 CE 20 3D 8E
C4E0:C1 A9 00 9D 20 CE 20 3F 4B
C4E8:C7 29 3F 18 69 64 9D 00 22
C4F0:CE 29 0F 8D 08 D4 20 3F F9
C4F8:C7 29 0F 18 69 48 9D 40 FB
C500:CE BD 51 C6 49 FF 2D 1B B8
C508:D0 8D 1B D0 A9 01 9D 50 AC
C510:CE 4C 30 C6 A9 10 8D 0B 3C
C518:D4 A9 11 8D 0B D4 FE 20 3D
C520:CE BD 20 CE C9 FF F0 2A CD
C528:38 E9 06 CD D7 C0 F0 05 90
C530:CD D8 C0 D0 14 48 BD 40 7B
C538:CE C9 FF F0 0B BD 51 C6 65
C540:49 FF 2D 1B D0 8D 1B D0 8B
C548:68 DD 40 CE D0 C3 C9 FF 9D
C550:D0 14 A9 00 9D 50 CE A9 F3
C558:15 8D 0B D4 CE C2 CE D0 70
C560:B0 68 68 4C 25 C0 A9 02 B1
C568:9D 50 CE BD 00 CE C9 87 E2
C570:B0 07 A9 01 9D 60 CE D0 38
C578:98 A9 00 9D 60 CE 4C 30 9B
C580:C6 BD 60 CE A8 BD 00 CE E2
C588:18 79 49 C6 9D 00 CE BD 5C
C590:20 CE 18 79 4D C6 9D 20 5B
C598:CE AD 72 CE 3D 51 C6 F0 DF
C5A0:03 4C 30 C6 BD 00 CE C9 88
C5A8:55 90 34 C9 E1 B0 30 A0 F8
C5B0:02 BD 20 CE 38 F9 D4 C0 B1
C5B8:C9 FA B0 1D BD 20 CE 38 14
C5C0:F9 D7 C0 C9 06 90 07 C9 3E
C5C8:0E 90 14 88 10 E3 BD 20 36
C5D0:CE 18 69 40 9D 40 CE D0 57
C5D8:44 20 39 C6 4C 12 C6 BD 18
C5E0:60 CE C9 01 D0 2C BD 20 6C
C5E8:CE C9 BA 90 25 EE B2 CE C7
C5F0:38 E9 BF 4A 4A 4A A8 A9 26
C5F8:14 8D C8 CE B9 43 C6 8D ED
C600:C7 CE 18 6D B6 CE 8D B6 C1
C608:CE 20 3D C1 20 E0 C0 4C 1B
C610:18 C6 EE B4 CE 20 3D C1 B7
C618:A9 FF 9D 40 CE A9 01 9D EE
C620:50 CE A9 00 85 F8 BD 00 4A
C628:CE C9 55 90 03 20 39 C6 15
C630:CA E0 02 F0 03 4C C2 C4 3E
C638:60 AD 1B D0 1D 51 C6 8D 1B
C640:1B D0 60 03 02 01 02 03 E6
C648:03 FF 01 FF 01 00 00 FF 7F
C650:01 01 02 04 08 10 20 40 20
C658:80 A0 02 A2 04 B9 00 CE 8E
C660:38 FD 03 CE 85 BE C9 07 98
C668:90 04 C9 FB 90 22 B9 20 D8
C670:CE 38 FD 23 CE 85 BF C9 3B
C678:04 90 04 C9 F9 90 11 BD 3B
C680:53 CE C9 02 D0 0A B9 A0 87
C688:CE C9 04 F0 03 9D 63 CE A3
C690:CA 10 CA 88 10 C5 60 FF C1
C698:F0 00 C0 18 00 E0 1C 00 F3
C6A0:B0 16 00 98 13 00 8F FF 4D
C6A8:80 84 10 80 84 10 80 84 8B
C6B0:10 80 FF F0 80 64 18 80 BB
C6B8:34 0C 80 1C 06 80 0C 03 82
C6C0:80 07 FF 80 00 00 00 00 58
C6C8:00 00 00 00 00 00 00 00 56
C6D0:00 00 00 00 00 00 7F 00 5D
C6D8:00 00 00 00 00 00 00 00 66
C6E0:00 00 00 00 00 00 00 00 6E
C6E8:00 00 00 00 00 F0 00 01 3B
C6F0:F8 00 01 F8 00 01 F8 00 A0
C6F8:00 F0 00 00 00 00 00 00 C2
C700:00 00 00 00 00 00 00 00 8F
C708:00 00 00 00 00 00 00 00 97
C710:00 00 00 00 00 00 7F 2E CC
C718:2E 2E 2E C4 D5 CE CB 2E 0C
C720:2E 2E 2E 50 52 45 53 53 BE
C728:20 46 49 52 45 42 55 54 D9
C730:54 4F 4E 20 54 4F 20 42 EB
C738:45 47 49 4E 2E 2E 2E AD 7E
C740:C4 CE 0A 0A 38 6D C4 CE 97
C748:8D C4 CE 60 00 00 00 00 AF
```

All Commodore 64 programs in this issue work with the Commodore 128 in 64 mode.

Turbo Copy

See instructions in article on page 81 before typing in.

```
0801:0B 08 0A 00 9E 32 30 36 2E
0809:31 00 00 00 A9 00 8D 20 3A
0811:D0 8D 21 D0 A9 80 8D 05 8D
0819:D4 A9 FF 8D 06 D4 A9 86 34
0821:8D 01 D4 A9 1E 8D 00 D4 69
0829:A9 6A 85 FB A9 0B 85 FC 9A
0831:20 CF 09 20 43 0A 20 49 34
0839:0A A9 1D 85 FB A9 0C 85 D8
0841:FC A2 02 20 C9 FF 20 CF 19
0849:09 20 CC FF 20 BE 09 20 AD
0851:18 0A A9 D4 85 FB A9 0A EB
0859:85 FC 20 CF 09 20 A4 09 87
0861:A9 A5 20 29 09 A9 00 A2 D7
0869:10 85 03 86 04 20 5F 09 14
0871:F0 16 08 A0 00 91 03 E6 BD
0879:03 28 30 F1 20 5F 09 91 5C
0881:03 C8 D0 F8 E6 04 D0 E5 BD
0889:20 5F 09 10 03 4C 6E 08 D1
0891:20 9A 09 20 18 0A A9 56 0E
0899:85 FB A9 0A 85 FC 20 CF 71
08A1:09 20 A4 09 20 29 09 A9 C4
08A9:00 85 03 A9 10 85 04 A0 55
08B1:00 20 5F 09 D0 17 B1 03 8F
08B9:08 20 29 09 E6 03 28 30 4F
08C1:F0 B1 03 20 29 09 C8 D0 E8
08C9:F8 E6 04 D0 E4 10 0B A5 C0
08D1:03 A6 04 85 30 86 31 4C 30
08D9:B2 08 C9 03 D0 06 20 9A 28
08E1:09 4C 50 08 C9 09 D0 0B 33
08E9:A5 30 A6 31 85 03 86 04 0A
08F1:4C B2 08 C9 24 D0 03 4C 29
08F9:0F 09 20 9A 09 20 18 0A 84
0901:A9 A9 85 FB A9 0A 85 FC 40
0909:20 CF 09 4C 20 09 20 9A 05
0911:09 20 18 0A A9 23 85 FB 34
0919:A9 0B 85 FC 20 CF 09 20 B5
0921:A4 09 20 9A 09 4C 50 08 97
0929:85 6B A9 35 85 01 A9 0B EF
0931:8D 00 DD AD 00 DD 10 FB 34
0939:A9 03 8D 00 DD A2 04 A9 BD
0941:03 46 6B 6A 46 6B 6A 4A 79
0949:4A EA 8D 00 DD CA D0 EF 98
0951:E6 FD A5 FD D0 03 EE 20 7B
0959:D0 A9 34 85 01 60 A9 35 2F
0961:85 01 A9 0B 8D 00 DD AD 32
0969:00 DD 10 FB A9 03 8D 00 29
0971:DD A2 05 CA EA D0 FC A2 9F
0979:04 AD 00 DD 0A 08 0A 26 81
0981:6B 28 26 6B CA D0 F2 E6 35
0989:FD A5 FD D0 03 CE 20 D0 35
0991:A9 34 85 01 A5 6B 49 FF B3
0999:60 A9 36 85 01 A9 1B 8D D7
09A1:11 D0 60 58 20 34 0A C0 A8
09A9:4E D0 03 4C E2 FC A9 0B A5
09B1:8D 11 D0 A0 20 CA D0 FD BE
09B9:88 D0 FA 78 60 A9 0A A2 8B
09C1:00 A0 00 88 D0 FD CA D0 69
09C9:F8 E9 01 D0 F2 60 A0 00 5A
09D1:B1 FB C9 A1 F0 15 C9 87 06
09D9:F0 12 C9 AB F0 2E 20 D2 30
09E1:FF 20 07 0A D0 EA E6 FC 7A
09E9:4C D1 09 60 20 07 0A B1 A0
09F1:FB AA 20 07 0A B1 FB 20 50
09F9:07 0A 84 20 A8 18 20 F0 7B
0A01:FF A4 20 4C D1 09 C8 D0 1C
0A09:E2 E6 FC 60 20 CC FF A2 C4
0A11:02 20 C9 FF 4C E2 09 A9 11
0A19:00 8D 20 D0 60 A9 0F 8D F6
0A21:18 D4 A9 11 8D 04 D4 60 43
0A29:A9 10 8D 04 D4 A9 00 8D E2
0A31:18 D4 60 20 1E 0A A9 00 01
0A39:85 C6 20 CF FF A8 20 29 CE
0A41:0A 60 A9 00 20 BD FF 60 FF
0A49:A9 02 A2 08 A0 0F 20 BA C3
0A51:FF 20 C0 FF 60 93 87 07 EC
0A59:0B 9A 70 4C 45 41 53 45 87
0A61:20 50 4C 41 43 45 20 54 FA
0A69:48 45 87 09 0B 05 44 45 AE
0A71:53 54 49 4E 41 54 49 4F 8F
0A79:4E 9A 20 44 49 53 4B 87 59
0A81:0B 0A 49 4E 54 4F 20 54 20
0A89:48 45 20 44 52 49 56 45 05
0A91:20 41 4E 44 87 0D 0D 50 EE
0A99:52 45 53 53 20 12 98 72 B4
0AA1:65 74 75 72 6E 90 0D A1 CC
0AA9:93 87 09 0D 05 64 69 73 5B
0AB1:6B 20 65 72 72 6F 72 21 AE
0AB9:21 87 0F 0B 9A 74 52 59 77
0AC1:20 41 47 41 49 4E 20 28 1F
0AC9:05 59 9A 2F 05 4E 9A 29 BC
0AD1:3F 05 A1 93 87 07 0B 9A 3D
0AD9:70 4C 45 41 53 45 20 50 36
0AE1:4C 41 43 45 20 54 48 45 51
0AE9:87 09 0E 05 53 4F 55 52 EA
0AF1:43 45 9A 20 44 49 53 4B 87
0AF9:87 0B 09 20 49 4E 54 4F 33
0B01:20 54 48 45 20 44 52 49 99
0B09:56 45 20 41 4E 44 87 0D 53
0B11:0D 50 52 45 53 53 20 12 9A
0B19:98 72 65 74 75 72 6E 90 EE
0B21:0D A1 93 87 06 0E 9A 54 03
0B29:48 45 20 43 4F 50 59 27 82
0B31:53 87 08 0E 05 63 6F 6D B6
0B39:70 6C 65 74 65 64 21 87 1D
0B41:09 0E 9A A3 A3 A3 A3 A3 83
0B49:A3 A3 A3 A3 A3 87 0F 0A 2C
```

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ØB51:61 4E 4F 54 48 45 52 2Ø F6
ØB59:43 4F 5Ø 59 2Ø 28 Ø5 59 89
ØB61:9A 2F Ø5 4E 9A 29 3F Ø5 13
ØB69:A1 93 ØE 87 Ø6 Ø6 12 1C F7
ØB71:2Ø 2Ø 2Ø 81 2Ø 2Ø 2Ø 9E 1C
ØB79:2Ø 2Ø 2Ø 99 2Ø 2Ø 2Ø 1E 25
ØB81:2Ø 2Ø 2Ø 9A 2Ø 2Ø 2Ø 1F 3E
ØB89:2Ø 2Ø 2Ø 9C 2Ø 2Ø 2Ø Ø5 4C
ØB91:2Ø 2Ø 2Ø 87 Ø7 Ø6 12 1C CC
ØB99:2Ø 74 2Ø 81 2Ø 75 2Ø 9E AE
ØBA1:2Ø 72 2Ø 99 2Ø 62 2Ø 1E EA
ØBA9:2Ø 6F 2Ø 9A 2Ø 63 2Ø 1F 47
ØBB1:2Ø 6F 2Ø 9C 2Ø 7Ø 2Ø Ø5 89
ØBB9:2Ø 79 2Ø 87 Ø8 Ø6 12 1C 53
ØBC1:2Ø 2Ø 2Ø 81 2Ø 2Ø 2Ø 9E 6C
ØBC9:2Ø 2Ø 2Ø 99 2Ø 2Ø 2Ø 1E 75
ØBD1:2Ø 2Ø 2Ø 9A 2Ø 2Ø 2Ø 1F 8E
ØBD9:2Ø 2Ø 2Ø 9C 2Ø 2Ø 2Ø Ø5 9C
ØBE1:2Ø 2Ø 2Ø 87 Ø6 Ø4 92 98 BA
ØBE9:34 2D 4D 49 4E 55 54 45 59
ØBF1:2Ø 48 49 47 48 2D 53 5Ø B5
ØBF9:45 45 44 2Ø 44 49 53 4B C7
ØC01:2Ø 43 4F 5Ø 49 45 52 87 74
ØC09:14 Ø6 9Ø 42 59 2Ø 61 2E AØ
ØC11:2Ø 6D 2E 2Ø 63 55 54 52 C7
ØC19:4F 4E 9A A1 4D 2D 57 ØØ A7
ØC21:Ø3 22 A5 ØØ 29 Ø6 FØ 11 4C
ØC29:C9 Ø2 DØ Ø3 4C 1A Ø3 C9 8B
ØC31:Ø4 DØ Ø3 4C CA Ø5 4C 4E F5
ØC39:Ø4 4C 9E FD A5 44 4A 4A 37
ØC41:4A 4A 4A AA AB 4D 2D 57 49
ØC49:22 Ø3 22 BD 4A Ø4 85 Ø6 CC
ØC51:A5 77 DØ Ø4 E6 77 A5 43 18
ØC59:85 ØA A9 Ø5 85 Ø9 A9 5A 3A
ØC61:85 4B A9 52 85 24 2Ø 56 BC
ØC69:F5 5Ø FE B8 AD AB 4D 2D DF
ØC71:57 44 Ø3 22 Ø1 1C C5 24 FØ
ØC79:FØ Ø9 C6 4B DØ EF A9 ØA 7D
ØC81:4C 69 F9 A2 ØØ 5Ø FE B8 7B
ØC89:AD Ø1 1C 95 25 E8 EØ Ø7 2B
ØC91:9Ø F3 2Ø 97 F4 A5 AB 4D 4F
ØC99:2D 57 66 Ø3 22 16 45 17 26
ØCA1:45 18 45 19 45 1A FØ Ø7 18
ØCA9:C6 Ø9 DØ CØ 4C 1E F4 A5 F7
ØCB1:18 C5 Ø6 FØ Ø3 4C ØB F4 6B
ØCB9:85 22 A5 16 A6 17 85 AB 7B
ØCC1:4D 2D 57 88 Ø3 22 12 86 8A
ØCC9:13 A6 19 E8 E8 E4 43 9Ø B8
ØCD1:Ø2 A2 ØØ A9 Ø2 85 31 4C Ø3
ØCD9:3D Ø4 CA DØ 15 4C 19 Ø4 Ø8
ØCE1:86 Ø7 86 19 8A 45 18 45 4Ø
ØCE9:AB 4D 2D 57 AA Ø3 22 17 Ø3
ØCF1:45 16 85 1A 2Ø 34 F9 A2 EC
ØCF9:5A 2Ø 56 F5 5Ø FE B8 AD ØF
ØD01:Ø1 1C D9 24 ØØ DØ DA C8 E1
ØD09:CØ Ø8 DØ FØ 2Ø 56 F5 5Ø 45
ØD11:FE AB 4D 2D 57 CC Ø3 22 28
ØD19:B8 AD Ø1 1C 91 3Ø C8 DØ 8C
ØD21:F5 AØ BA 5Ø FE B8 AD Ø1 F1
ØD29:1C 99 ØØ Ø1 C8 DØ F4 2Ø 5B
ØD31:EØ F8 A5 38 C5 47 DØ 2D 4C
ØD39:2Ø E9 AB 4D 2D 57 EE Ø3 CF
ØD41:22 F5 C5 3A FØ ØB A6 Ø7 4E
ØD49:BD 5Ø Ø1 DØ 23 A9 Ø5 DØ 1E
ØD51:21 E6 19 A5 19 2Ø 63 Ø5 48
ØD59:B9 ØØ Ø2 2Ø 63 Ø5 C8 DØ 24
ØD61:F7 AD ØØ AB 4D 2D 57 1Ø 7B
ØD69:Ø4 22 1C 49 Ø8 8D ØØ 1C B8
ØD71:A9 FF 2C A9 84 A6 Ø7 Ø9 56
ØD79:8Ø 9D 5Ø Ø1 Ø8 AØ ØØ 8C A4
ØD81:FE Ø2 28 1Ø Ø7 C6 ØA DØ D9
ØD89:Ø3 4C 9E FD AB 4D 2D 57 3Ø
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ØDA9:4C A2 Ø3 Ø9 Ø9 ØA ØB A5 AF
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ØDC9:ØØ A5 39 99 ØØ Ø2 C8 C8 7Ø
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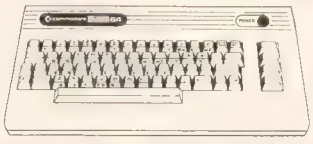
commodore 64



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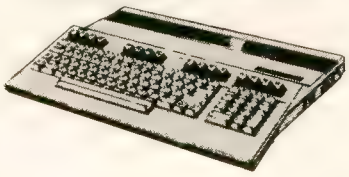

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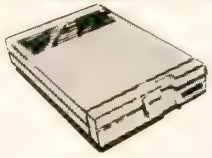

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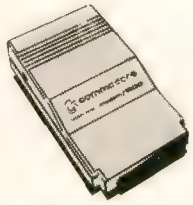

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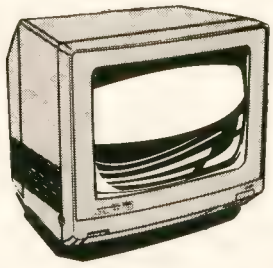

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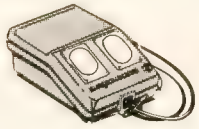

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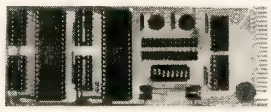

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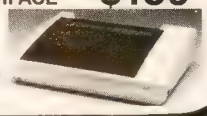

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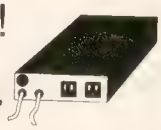

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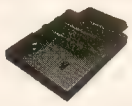

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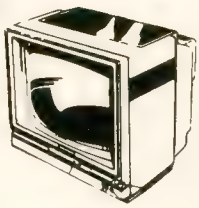

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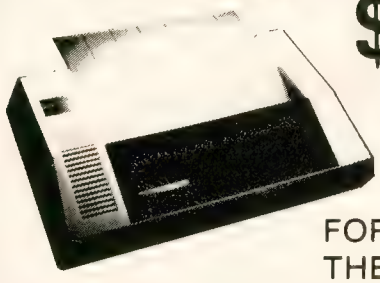

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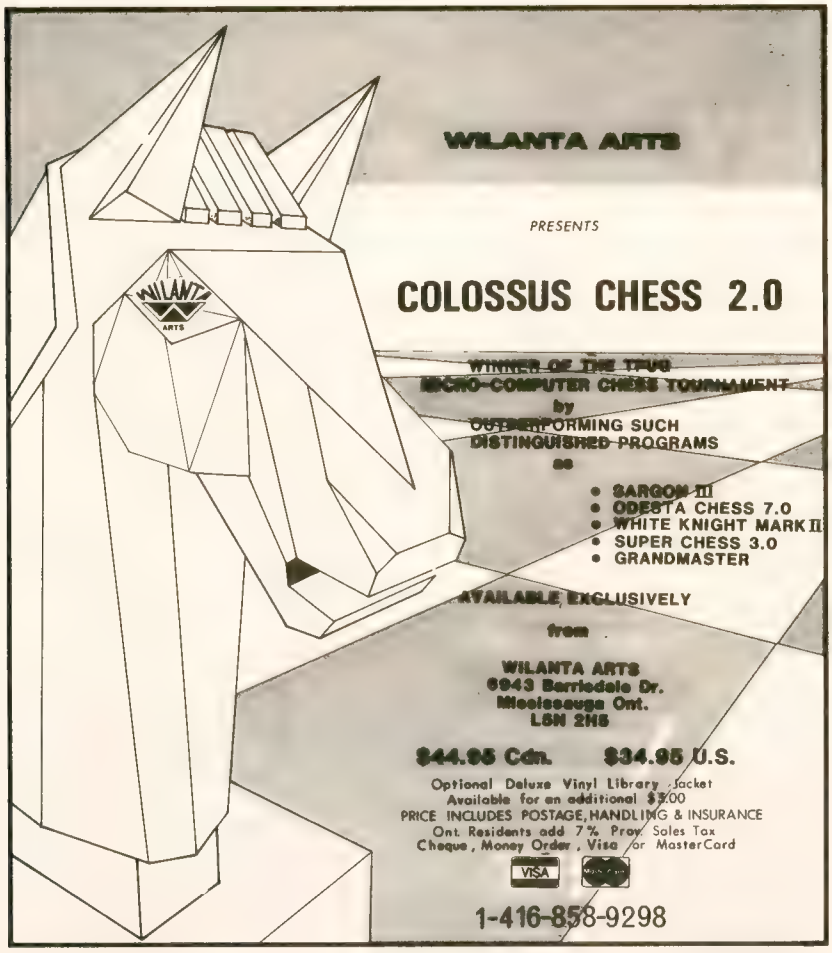

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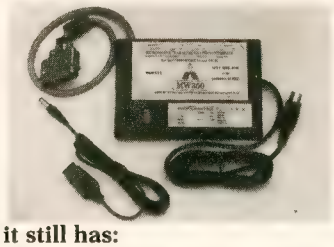

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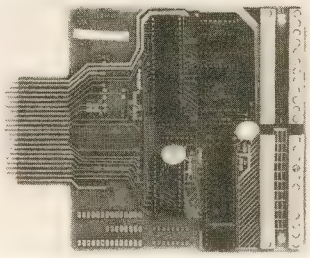

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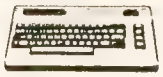

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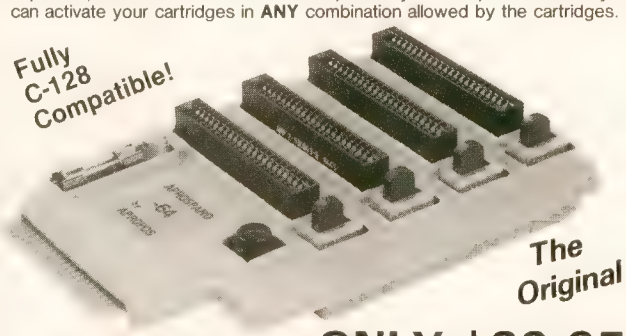

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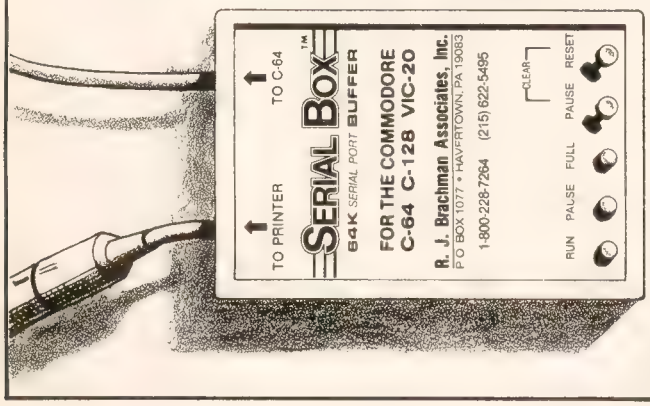

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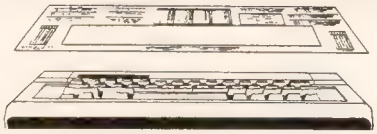

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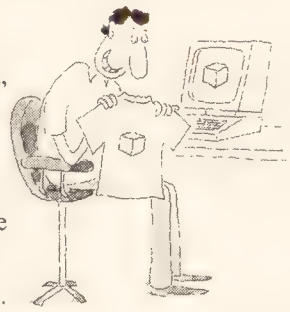

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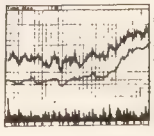

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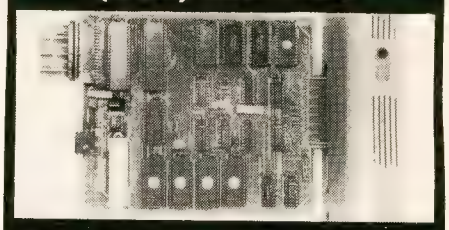

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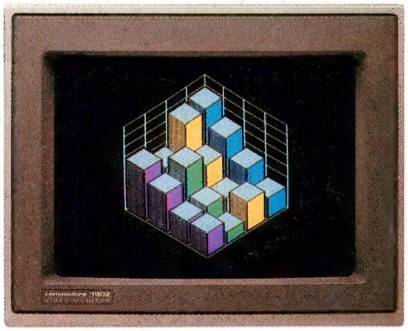

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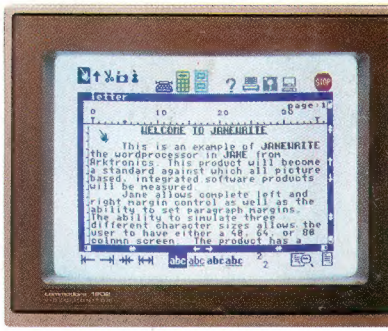

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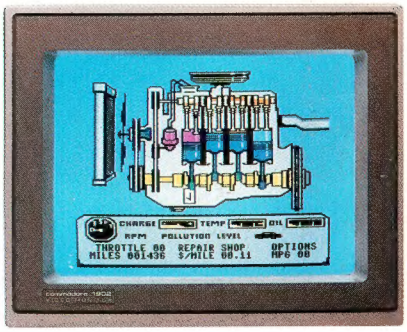

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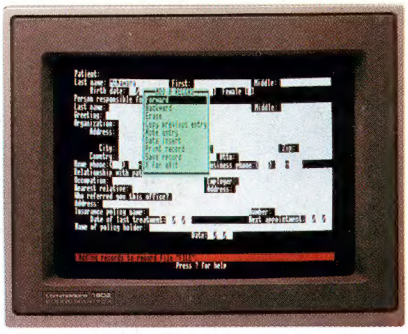

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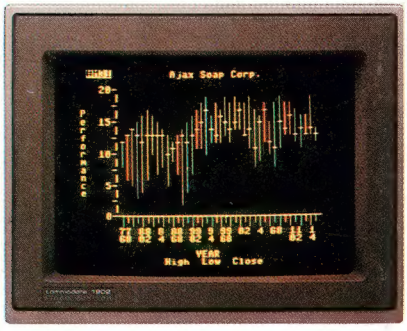

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